

Final

Site Investigation Report
Former Rifle/Machine Gun Range, Parcel 104Q

Fort McClellan
Calhoun County, Alabama

Prepared for:

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Executive Summary

In accordance with Contract Number DACA21-96-D-0018, Task Order CK10, Shaw Environmental, Inc. completed a site investigation (SI) at the Former Rifle/Machine Gun Range, Parcel 104Q, at Fort McClellan in Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at the site and, if present, whether the concentrations pose an unacceptable risk to human health or the environment. The SI at the Former Rifle/Machine Gun Range, Parcel 104Q, consisted of the collection and analysis of 22 surface soil samples, 22 subsurface soil samples, and 2 groundwater samples. Two permanent monitoring wells were also installed at the site to facilitate groundwater sample collection and to provide site-specific geological and hydrogeological characterization information.

Chemical analysis of samples collected at the Former Rifle/Machine Gun Range, Parcel 104Q, indicates that metals, volatile organic compounds, pesticides, and one herbicide were detected in site media. Semivolatile organic compounds and explosives were not detected in site media. To evaluate whether the detected constituents pose an unacceptable risk to human health or the environment, the analytical results were compared to human health site-specific screening levels, ecological screening values, and background screening values for Fort McClellan. Site metals data were further evaluated using statistical and geochemical methods to determine if the metals detected in site media were naturally occurring. A human health preliminary risk assessment (PRA) and preliminary ecological risk assessment (PERA) were also performed to further characterize the potential threat to human health and the environment.

Although Parcel 104Q is projected for industrial and passive recreation reuse, the analytical data were evaluated against a residential reuse scenario to determine if the site is suitable for unrestricted future use. The statistical and geochemical evaluations determined that the metals detected in site media were present at naturally occurring levels. The PRA did not identify any chemicals of potential concern in site media. Therefore, the PRA concluded that exposure to site media does not pose a threat to human health.

The PERA initially identified three pesticides and one herbicide as constituents of potential ecological concern in surface soil. Following further evaluation of the chemicals using additional lines of evidence, the PERA determined that these chemicals should not be retained as constituents of ecological concern. Therefore, the PERA concluded that these compounds are unlikely to pose a risk to ecological receptors at the site.

1
2 Based on the results of the SI, past operations at the Former Rifle/Machine Gun Range, Parcel
3 104Q, have not adversely impacted the environment. The metals and chemical compounds
4 detected in site media do not pose an unacceptable risk to human health and the environment.
5 Therefore, Shaw Environmental, Inc. recommends "No Further Action" and unrestricted land
6 reuse with regard to CERCLA-related hazardous substances at the Former Rifle/Machine Gun
7 Range, Parcel 104Q.

8

1.0 Introduction

The U.S. Army has selected Fort McClellan (FTMC), located in Calhoun County, Alabama, for closure by the Base Realignment and Closure (BRAC) Commission under Public Laws 100-526 and 101-510. The 1990 Base Closure Act, Public Law 101-510, established the process by which U.S. Department of Defense (DOD) installations would be closed or realigned. The BRAC Environmental Restoration Program requires investigation and cleanup of federal properties prior to transfer to the public domain. The U.S. Army is conducting environmental studies of the impact of suspected contaminants at parcels at FTMC under the management of the U.S. Army Corps of Engineers (USACE)-Mobile District. The USACE contracted Shaw Environmental, Inc. (Shaw) (formerly IT Corporation [IT]) to perform the site investigation (SI) at the Former Rifle/Machine Gun Range, Parcel 104Q, under Contract Number DACA21-96-D-0018, Task Order CK10.

This report presents specific information and results compiled from the SI, including field sampling and analysis and monitoring well installation activities conducted at the Former Rifle/Machine Gun Range, Parcel 104Q.

1.1 Project Description

The Former Rifle/Machine Gun Range, Parcel 104Q, was identified as an area to be investigated prior to property transfer. The site was classified as a Category 1 Qualified parcel in the *Final Environmental Baseline Survey, Fort McClellan, Alabama*, (Environmental Science and Engineering, Inc. [ESE], 1998). Category 1 Qualified parcels are areas that have no evidence of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-related hazardous substance or petroleum product storage, release, or disposal but that do have other environmental or safety concerns. Parcel 104Q was qualified because chemicals of potential concern (COPC) may be present as a result of historical range activities.

A site-specific work plan, comprised of a field sampling plan (SFSP), a safety and health plan, and an unexploded ordnance (UXO) safety plan, was finalized in March 2002 (IT, 2002a). The work plan was prepared to provide technical guidance for SI field activities at the Former Rifle/Machine Gun Range, Parcel 104Q. The site-specific work plan was used as an attachment to the installation-wide work plan (IT, 1998) and the installation-wide sampling and analysis plan (SAP) (IT, 2000a; IT, 2002b). The SAP includes the installation-wide safety and health plan and quality assurance plan.

1
2 The SI included fieldwork to collect 22 surface soil samples, 22 subsurface soil samples, and 2
3 groundwater samples to determine whether potential site-specific chemicals are present at the
4 site.

5 6 **1.2 Purpose and Objectives**

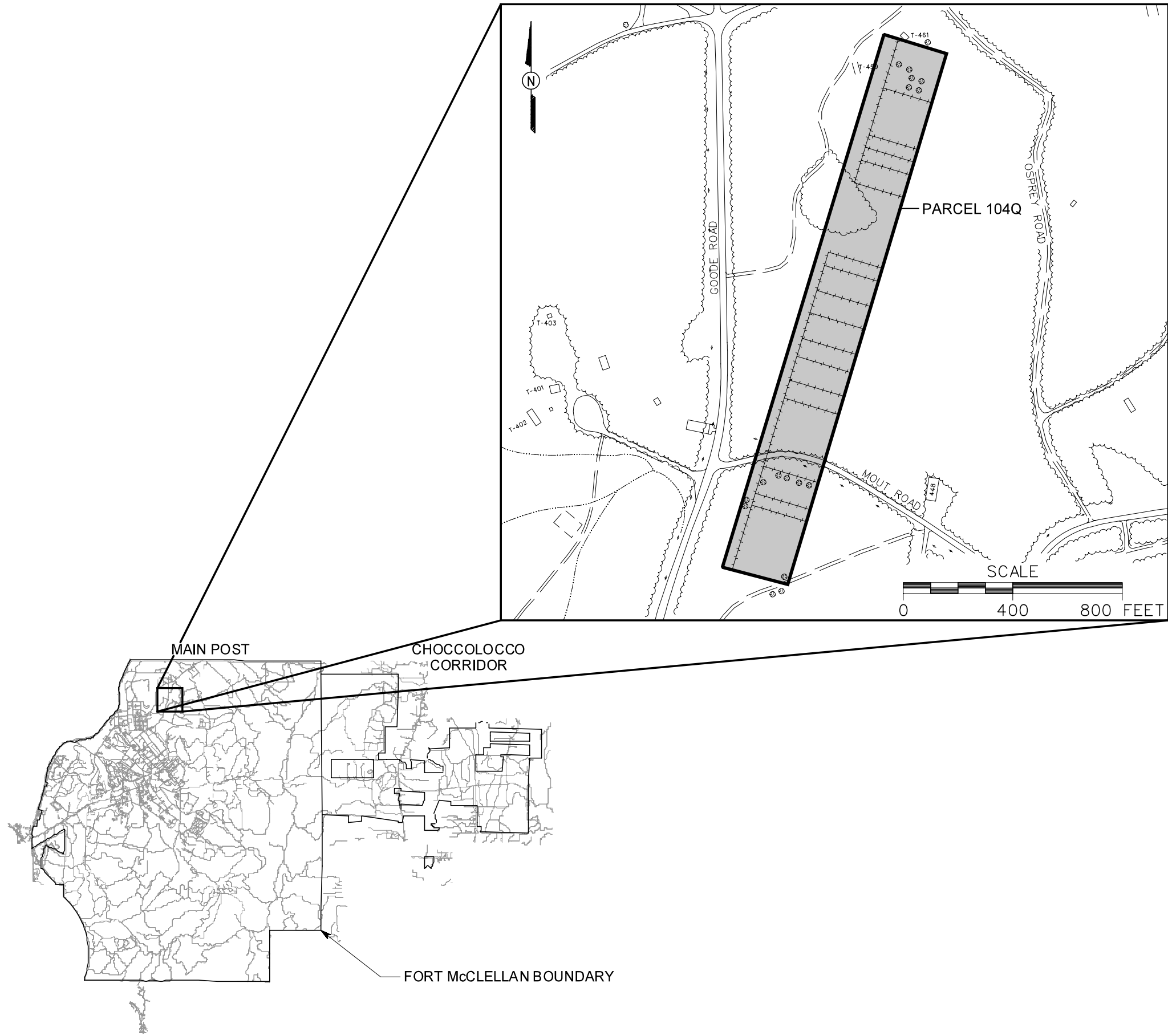
7 The SI program was designed to collect data from site media and provide a level of defensible
8 data and information in sufficient detail to determine whether chemical constituents are present
9 at the Former Rifle/Machine Gun Range, Parcel 104Q, at concentrations that pose an
10 unacceptable risk to human health or the environment. The conclusions of the SI in Chapter 6.0
11 are based on the comparison of the analytical results to human health site-specific screening
12 levels (SSSL), ecological screening values (ESV), and background screening values for FTMC.
13 The SSSLs and ESVs were developed by Shaw as part of the human health and ecological risk
14 evaluations associated with SIs being performed under the BRAC Environmental Restoration
15 Program at FTMC. The SSSLs and ESVs are presented in the *Final Human Health and*
16 *Ecological Screening Values and PAH Background Summary Report* (IT, 2000b). Background
17 metals screening values are presented in the *Final Background Metals Survey Report, Fort*
18 *McClellan, Alabama* (Science Applications International Corporation [SAIC], 1998). Site metals
19 data were also evaluated using statistical and geochemical methods to determine if the metals
20 were site related. In addition, a human health preliminary risk assessment (PRA) and preliminary
21 ecological risk assessment (PERA) were performed to further characterize potential risks to
22 human health and the environment.

23
24 Based on the conclusions presented in this SI report, the BRAC Cleanup Team will decide either
25 to propose “No Further Action” or to conduct additional work at the site.

26 27 **1.3 Site Description and History**

28 The Former Rifle/Machine Gun Range, Parcel 104Q, is located east of Goode Road in the north-
29 central area of the FTMC Main Post (Figure 1-1). The EBS documents this site as one of seven
30 former rifle/machine gun ranges identified in the northern portion of the Main Post (ESE, 1998).
31 Parcel 104Q, which covers approximately 12 acres, is oriented generally north to south, with the
32 firing line area along the northern parcel boundary (Figure 1-2).

33
34 In the *Archives Search Report (ASR)*, the Former Rifle/Machine Gun Range, Parcel 104Q, is
35 referred to as World War I Machine Gun Range (USACE, 2001a). The ASR states this machine
36 gun range was built during World War I and was abandoned sometime prior to World War II.

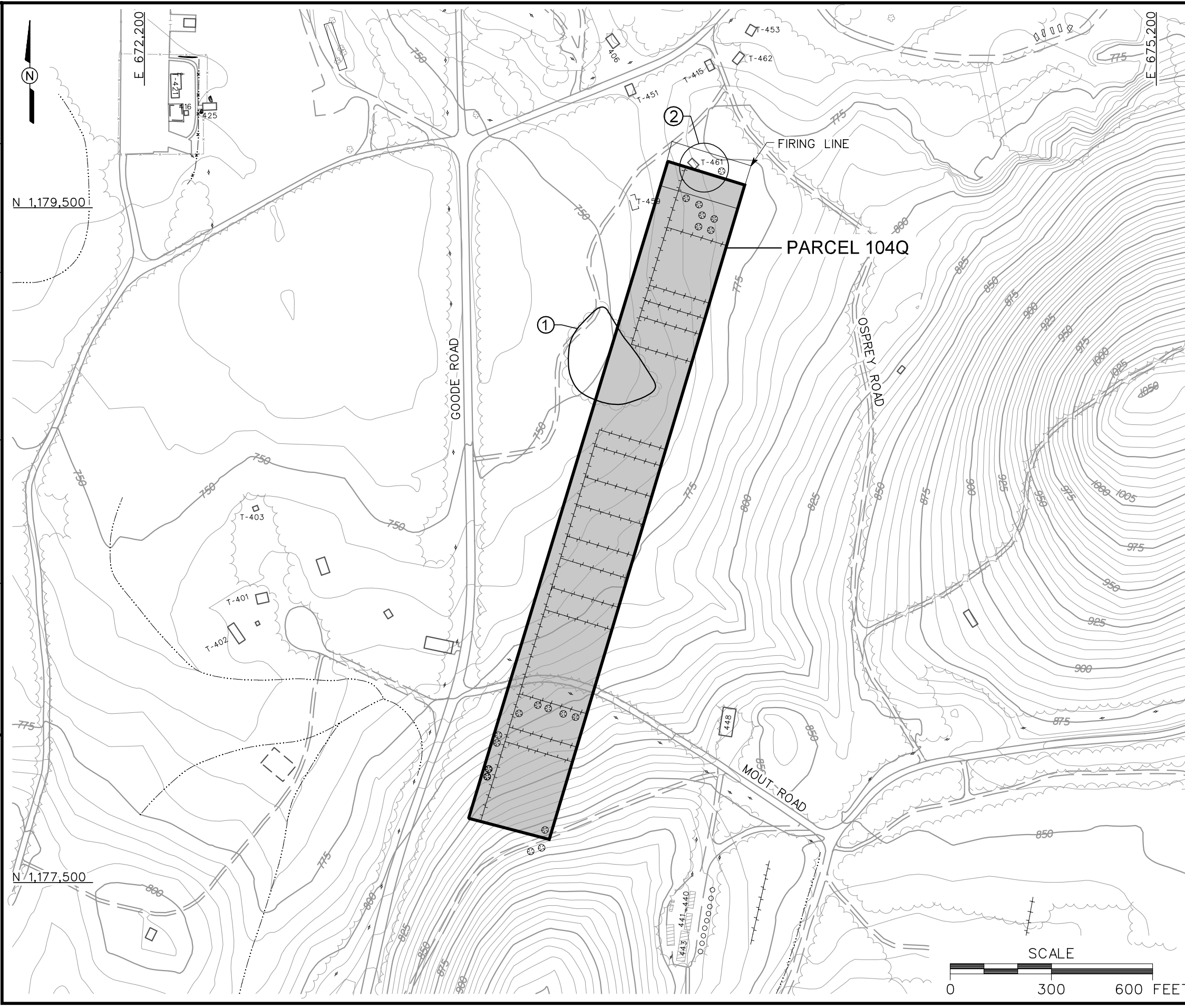


LEGEND

- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- BUILDING
- TREES / TREELINE
- PARCEL BOUNDARY
- SURFACE DRAINAGE / CREEK
- UTILITY POLE
- BERM
- DEPRESSION (POSSIBLE FOXHOLE OR TARGET BUNKERS)

FIGURE 1-1
SITE LOCATION MAP
FORMER RIFLE/MACHINE GUN RANGE
PARCEL 104Q

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018



LEGEND

UNIMPROVED ROADS AND PARKING

PAVED ROADS AND PARKING

BUILDING

TOPOGRAPHIC CONTOURS
(CONTOUR INTERVAL - 5 FOOT)

TREES / TREELINE

PARCEL BOUNDARY

FIRING LINE

SURFACE DRAINAGE / CREEK

UTILITY POLE

BERM

DEPRESSION (POSSIBLE FOXHOLE OR
TARGET BUNKERS)

APPROXIMATE LOCATION OF OBSERVED FEATURES

①

CLEARED AREA IDENTIFIED ON
1982 AERIAL PHOTOGRAPH

②

GRAVEL AREA WITH UTILITY POLE

FIGURE 1-2

SITE MAP

FORMER RIFLE/MACHINE GUN RANGE

PARCEL 104Q

U. S. ARMY CORPS OF ENGINEERS

MOBILE DISTRICT

FORT McCLELLAN

CALHOUN COUNTY, ALABAMA

Contract No. DACA21-96-D-0018

Shaw

Shaw Environmental, Inc.

1 Documentation indicates that only machine gun fire was conducted at this range; there is no
2 indication that explosive ordnance was used on the range. The World War I Machine Gun Range
3 was located in the western portion of the Defendum Area ranges, and is shown on Plate 3 (World
4 War I Use), Plate 4 (Inter-War Use), and Plate 10 (Cumulative Map of All Ranges) of the ASR
5 (USACE, 2001a). The orientation of the range is generally the same on all plates, as shown on
6 the Range Location Map (Figure 1-3).

7
8 Available aerial photographs (1937 through 1998) were reviewed to identify any land-use activity
9 at the Former Rifle/Machine Gun Range, Parcel 104Q. In the 1937 photograph, the parcel
10 appears to be overgrown, with virtually no disturbed areas (Figure 1-4). The 1940 photograph
11 shows that two roads have been cut across the southern portion of the parcel, apparently serving
12 as access roads to ranges east of Parcel 104Q (Figure 1-5). In the 1954 photograph, there are no
13 additional visibly disturbed areas. The 1969 photograph reveals increased activity at one of the
14 roads and increased use in the southern portion of the parcel, possibly the result of operations at
15 an adjacent range (Parcel 89Q). In the 1982 photograph, an area that extends into the western
16 portion of the parcel has been cleared of tree cover (Figure 1-6). This cleared area is also shown
17 on Figure 1-2 as observed feature No. 1. The review of aerial photographs did not reveal
18 evidence of an active range at Parcel 104Q, which supports the ASR documentation that use of
19 this range ceased prior to World War II.

20
21 During SI site walks conducted in December 2001, features consistent with use of the area as a
22 small-arms range were observed at Parcel 104Q. A series of partially eroded berms
23 (approximately 3 feet high) transect the width of the parcel at approximately 75-foot intervals
24 throughout much of the central and southern portions of the parcel. Signs mounted on trees mark
25 the endpoints of some of the berms, which appear to be target areas. Several rectangular
26 depressions (approximately 3 feet by 5 feet by 2 feet deep) are aligned roughly parallel to the
27 inside boundary of the firing line area in the northern portion of the parcel. Similar depressions
28 are also located in the southern portion of the parcel. Some of these are aligned with one of the
29 berms and others are aligned with the western parcel boundary. A gravel area with a utility pole
30 that may have been used as a parking or staging area for this or an adjacent range is located in the
31 northern area of the parcel (Figure 1-2).

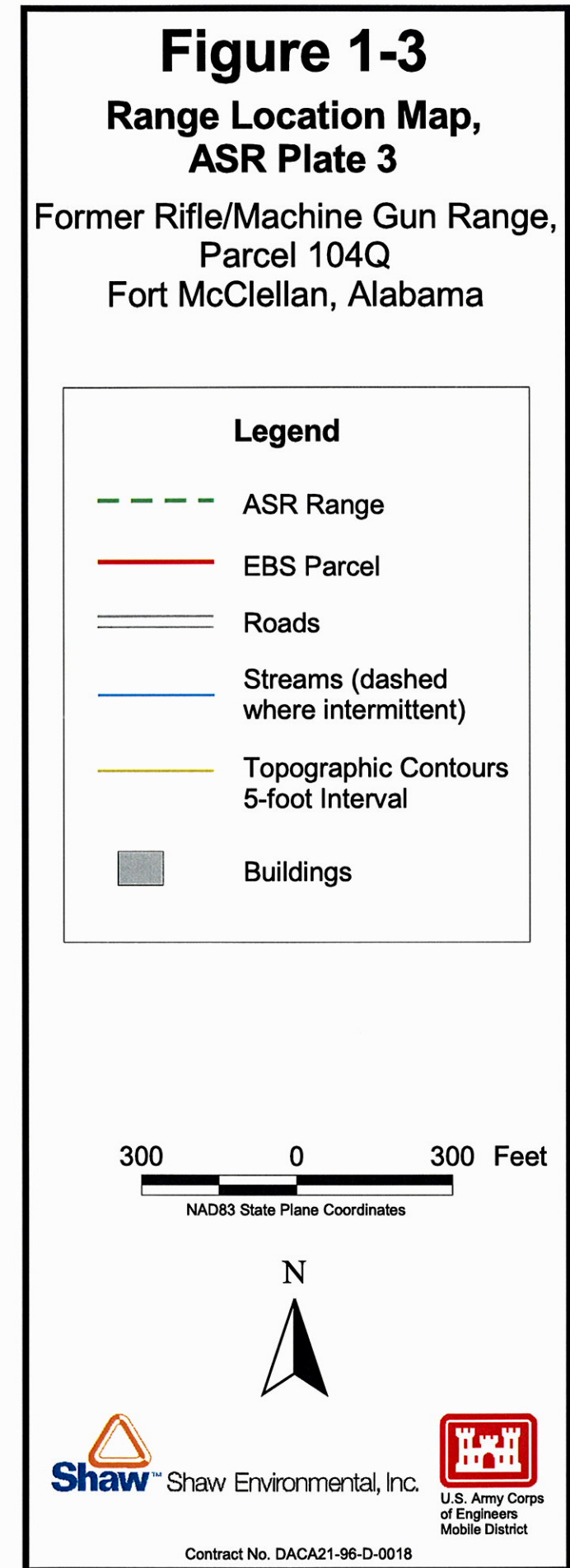
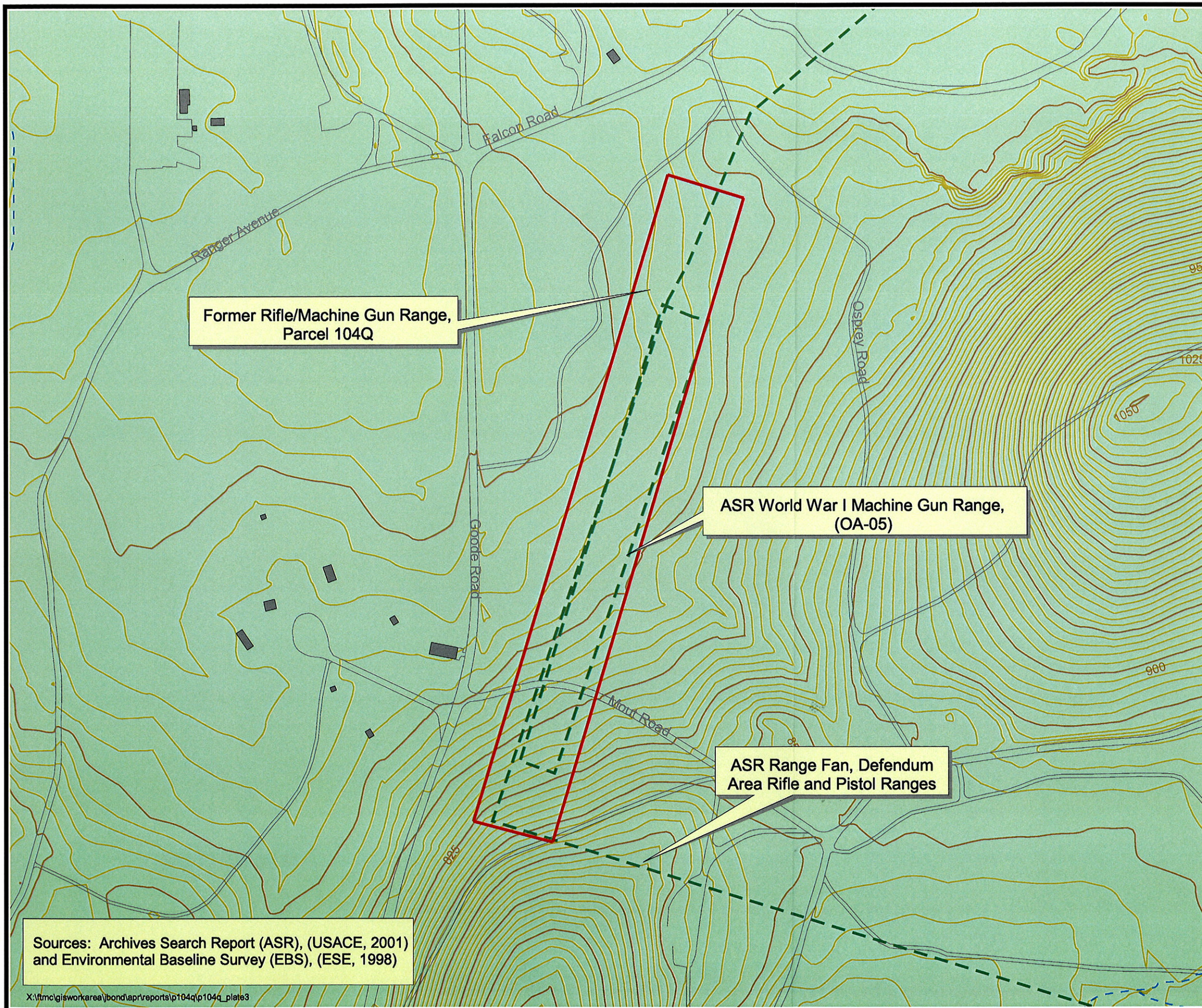






Figure 1-4
1937 Aerial Photograph
Former Rifle/Machine Gun Range,
Parcel 104Q
Fort McClellan, Alabama

Legend

— Parcel Boundary

300 0 300 Feet
NAD83 State Plane Coordinates

N

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Mobile District

Contract No. DACA21-96-D-0018



Figure 1-5

1940 Aerial Photograph

Former Rifle/Machine Gun Range,
Parcel 104Q
Fort McClellan, Alabama

Legend

 Parcel Boundary

300 0 300 Feet
NAD83 State Plane Coordinates



 Shaw Environmental, Inc.



Contract No. DACA21-96-D-0018



Figure 1-5

1940 Aerial Photograph

Former Rifle/Machine Gun Range,
Parcel 104Q
Fort McClellan, Alabama

Legend

 Parcel Boundary

300 0 300 Feet
NAD83 State Plane Coordinates



 Shaw Environmental, Inc.



Contract No. DACA21-96-D-0018



Former Rifle/Machine Gun Range,
Parcel 104Q

This map employs uncontrolled aerial photographs.
The resulting distortions affect the spatial accuracy
of the photographs.

X:\ftm\gisworkarea\bond\apn\reports\p104q\p104q_1982

Figure 1-6

1982 Aerial Photograph

Former Rifle/Machine Gun Range,
Parcel 104Q
Fort McClellan, Alabama

Legend

 Parcel Boundary

300 0 300 Feet
NAD83 State Plane Coordinates



 Shaw Environmental, Inc.



Contract No. DACA21-96-D-0018

2.0 Previous Investigations

An EBS was conducted by ESE to document current environmental conditions of all FTMC property (ESE, 1998). The study was to identify sites that, based on available information, have no history of contamination and comply with DOD guidance for fast-track cleanup at closing installations. The EBS also provides a baseline picture of FTMC properties by identifying and categorizing the properties by seven criteria:

1. Areas where no storage, release, or disposal of hazardous substances or petroleum products has occurred (including no migration of these substances from adjacent areas).
2. Areas where only release or disposal of petroleum products has occurred.
3. Areas where release, disposal, and/or migration of hazardous substances has occurred, but at concentrations that do not require a removal or remedial response.
4. Areas where release, disposal, and/or migration of hazardous substances has occurred, and all removal or remedial actions to protect human health and the environment have been taken.
5. Areas where release, disposal, and/or migration of hazardous substances has occurred, and removal or remedial actions are underway, but all required remedial actions have not yet been taken.
6. Areas where release, disposal, and/or migration of hazardous substances has occurred, but required actions have not yet been implemented.
7. Areas that are not evaluated or require additional evaluation.

For non-CERCLA environmental or safety issues, the parcel label includes the following components: a unique, non-CERCLA issue number; the letter "Q" designating the parcel as a Community Environmental Response Facilitation Act (CERFA) Category 1 Qualified parcel; and the code of the specific non-CERCLA issue(s) present (ESE, 1998). The non-CERCLA issue codes used are:

- A = Asbestos (in buildings)
- L = Lead-based paint (in buildings)
- P = Polychlorinated biphenyls
- R = Radon (in buildings)
- RD = Radionuclides/radiological issues

- X = UXO
- CWM = Chemical warfare material.

The EBS was conducted in accordance with CERFA protocols (Public Law 102-426) and DOD policy regarding contamination assessment. Record searches and reviews were performed on all reasonably available documents from FTMC, the Alabama Department of Environmental Management (ADEM), the U.S. Environmental Protection Agency (EPA) Region 4, and Calhoun County, as well as a database search of CERCLA-regulated substances, petroleum products, and Resource Conservation and Recovery Act-regulated facilities. Available historical maps and aerial photographs were reviewed to document historical land uses. Personal and telephone interviews of past and present FTMC employees and military personnel were conducted. In addition, visual site inspections were conducted to verify conditions of specific property parcels.

The Former Rifle/Machine Gun Range, Parcel 104Q, is an area where no known or recorded storage, release, or disposal (including migration) has occurred on site property. However, the parcel was qualified because COPCs may be present because of historical range activities. Therefore, the Former Rifle/Machine Gun Range, Parcel 104Q, required additional evaluation to determine its environmental condition.

3.0 Current Site Investigation Activities

This chapter summarizes SI activities conducted by Shaw at the Former Rifle/Machine Gun Range, Parcel 104Q, including UXO avoidance activities, environmental sampling and analysis, and groundwater monitoring well installation activities.

3.1 UXO Avoidance

UXO avoidance was performed at the Former Rifle/Machine Gun Range, Parcel 104Q, following methodology outlined in the SAP. Shaw UXO personnel used a low-sensitivity magnetometer to perform a surface sweep of the parcel prior to site access. After the site was cleared for access, sample locations were monitored by UXO personnel following procedures outlined in the SAP.

3.2 Environmental Sampling

Environmental sampling performed during the SI at the Former Rifle/Machine Gun Range, Parcel 104Q, included the collection of surface soil samples, subsurface soil samples, and groundwater samples for chemical analysis. Sample locations were determined by observing site physical characteristics during a site walk and by reviewing historical documents and aerial photographs pertaining to activities conducted at the site. The sample locations, media, and rationale are summarized in Table 3-1. Sampling locations are shown on Figure 3-1. Samples were submitted for laboratory analysis of site-related parameters listed in Section 3.4.

3.2.1 Surface Soil Sampling

Surface soil samples were collected from 22 locations at the Former Rifle/Machine Gun Range, Parcel 104Q, as shown on Figure 3-1. Soil sampling locations and rationale are presented in Table 3-1. Sample designations and analytical parameters are listed in Table 3-2. Soil sampling locations were determined in the field by the on-site geologist based on UXO avoidance activities, sampling rationale, presence of surface structures, and site topography.

Sample Collection. Surface soil samples were collected from the uppermost foot of soil using either a direct-push technology (DPT) sampling system or a stainless-steel hand auger, following the methodology specified in the SAP. Surface soil samples were collected by first removing surface debris (e.g., rocks and vegetation) from the immediate sample area. The soil was then collected with the sampling device and screened with a photoionization detector (PID) in accordance with procedures outlined in the SAP. As necessary, the soil fraction for volatile organic compound (VOC) analysis was collected directly from the sampler using three EnCore[®] samplers. The remaining soil was then transferred to a clean stainless-steel bowl, homogenized,

Table 3-1

**Sampling Locations and Rationale
Former Rifle/Machine Gun Range, Parcel 104Q
Fort McClellan, Calhoun County, Alabama**

(Page 1 of 2)

Sample Location	Sample Media	Sample Location Rationale
HR-104Q-GP01	Surface soil and subsurface soil	Surface and subsurface soil samples were collected near the northwest corner of the parcel within the graveled portion of the firing line area, downslope of most of the parcel, to determine if contaminated soil exists at this location.
HR-104Q-GP02	Surface soil and subsurface soil	Surface and subsurface soil samples were collected in the northern section of this parcel in the firing line area to determine if contaminant releases into the environment have occurred from former activities and if contaminated soil exists at this location.
HR-104Q-GP03	Surface soil and subsurface soil	Surface and subsurface soil samples were collected south of the firing line in an area of rectangular depressions, downslope of most of the depressions, to determine if contaminant releases into the environment have occurred from former activities and if contaminated soil exists at this location.
HR-104Q-GP04	Surface soil and subsurface soil	Surface and subsurface soil samples were collected at a bermed area (target line) in the north-central portion of the parcel to determine if contaminant releases into the environment have occurred from former activities and if contaminated soil exists at this location
HR-104Q-GP05	Surface soil and subsurface soil	Surface and subsurface soil samples were collected at a bermed area (target line) in the north-central portion of the parcel to determine if contaminant releases into the environment have occurred from former activities and if contaminated soil exists at this location
HR-104Q-GP06	Surface soil and subsurface soil	Surface and subsurface soil samples were collected at a bermed area (target line) in the north-central portion of the parcel to determine if contaminant releases into the environment have occurred from former activities and if contaminated soil exists at this location
HR-104Q-GP07	Surface soil and subsurface soil	Surface and subsurface soil samples were collected at a bermed area (target line) in the central portion of the parcel to determine if contaminant releases into the environment have occurred from former activities and if contaminated soil exists at this location
HR-104Q-GP08	Surface soil and subsurface soil	Surface and subsurface soil samples were collected at a bermed area (target line) in the central portion of the parcel to determine if contaminant releases into the environment have occurred from former activities and if contaminated soil exists at this location
HR-104Q-GP09	Surface soil and subsurface soil	Surface and subsurface soil samples were collected at a bermed area (target line) in the central portion of the parcel to determine if contaminant releases into the environment have occurred from former activities and if contaminated soil exists at this location
HR-104Q-GP10	Surface soil and subsurface soil	Surface and subsurface soil samples were collected at a bermed area (target line) in the central portion of the parcel to determine if contaminant releases into the environment have occurred from former activities and if contaminated soil exists at this location
HR-104Q-GP11	Surface soil and subsurface soil	Surface and subsurface soil samples were collected at a bermed area (target line) in the central portion of the parcel to determine if contaminant releases into the environment have occurred from former activities and if contaminated soil exists at this location
HR-104Q-GP12	Surface soil and subsurface soil	Surface and subsurface soil samples were collected at a bermed area (target line) in the central portion of the parcel to determine if contaminant releases into the environment have occurred from former activities and if contaminated soil exists at this location

Table 3-1

**Sampling Locations and Rationale
Former Rifle/Machine Gun Range, Parcel 104Q
Fort McClellan, Calhoun County, Alabama**

(Page 2 of 2)

Sample Location	Sample Media	Sample Location Rationale
HR-104Q-GP13	Surface soil and subsurface soil	Surface and subsurface soil samples were collected at a bermed area (target line) in the south-central portion of the parcel to determine if contaminant releases into the environment have occurred from former activities and if contaminated soil exists at this location
HR-104Q-GP14	Surface soil and subsurface soil	Surface and subsurface soil samples were collected adjacent to depressions and bermed target line in the southern portion of the parcel, south of MOUT Road, to determine if contaminant releases into the environment have occurred from former activities and if contaminated soil exists at this location
HR-104Q-GP15	Surface soil and subsurface soil	Surface and subsurface soil samples were collected adjacent to depressions and bermed target line in the southern portion of the parcel, south of MOUT Road, to determine if contaminant releases into the environment have occurred from former activities and if contaminated soil exists at this location
HR-104Q-GP16	Surface soil and subsurface soil	Surface and subsurface soil samples were collected at a bermed area (target line) in the southern portion of the parcel, south of MOUT Road, to determine if contaminant releases into the environment have occurred from former activities and if contaminated soil exists at this location
HR-104Q-GP17	Surface soil and subsurface soil	Surface and subsurface soil samples were collected downslope of two depressions in the southern portion of the parcel, south of MOUT Road, to determine if contaminant releases into the environment have occurred from former activities and if contaminated soil exists at this location
HR-104Q-GP18	Surface soil and subsurface soil	Surface and subsurface soil samples were collected upslope of the parcel to determine if contaminant releases into the environment have occurred from former activities and if contaminated soil exists at this location
HR-104Q-GP19	Surface soil and subsurface soil	Surface and subsurface soil samples were collected upslope of the parcel to determine if contaminant releases into the environment have occurred from former activities and if contaminated soil exists at this location
HR-104Q-GP20	Surface soil and subsurface soil	Surface and subsurface soil samples were collected in the south-central portion of the parcel, upslope of one bermed target line and downslope of another bermed target line, to determine if contaminant releases into the environment have occurred from former activities and if contaminated soil exists at this location.
HR-104Q-MW01	Surface soil, subsurface soil and groundwater	Surface soil, subsurface soil, and groundwater samples were collected near a series of bermed target lines in the central area of the parcel to determine if contaminant releases into the environment have occurred from former activities and if contaminated media exists at this location.
HR-104Q-MW02	Surface soil, subsurface soil and groundwater	Surface soil, subsurface soil, and groundwater samples were collected near a series of bermed target lines in the northern area of the parcel to determine if contaminant releases into the environment have occurred from former activities and if contaminated media exists at this location.

Table 3-2

**Soil Sample Designations and Analytical Parameters
Former Rifle/Machine Gun Range, Parcel 104Q
Fort McClellan, Calhoun County, Alabama**

(Page 1 of 2)

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples		Analytical Parameters
			Field Duplicates	MS/MSD	
HR-104Q-GP01	HR-104Q-GP01-SS-QK0001-REG HR-104Q-GP01-DS-QK0003-REG	0-1 2-4	HR-104Q-GP01-SS-QK0002-FD	HR-104Q-GP01-SS-QK0001-MS/MSD	Metals, VOCs, SVOCs, Explosives, Pesticides, and Herbicides
HR-104Q-GP02	HR-104Q-GP02-SS-QK0004-REG HR-104Q-GP02-SS-QK0005-REG	0-1 3-4			Metals and Explosives
HR-104Q-GP03	HR-104Q-GP03-SS-QK0006-REG HR-104Q-GP03-DS-QK0007-REG	0-1 3-4	HR-104Q-GP03-DS-QK0008-FD		Metals, VOCs, SVOCs, Explosives, Pesticides, and Herbicides
HR-104Q-GP04	HR-104Q-GP04-SS-QK0009-REG HR-104Q-GP04-DS-QK0010-REG	0-1 2-4			Metals and Explosives
HR-104Q-GP05	HR-104Q-GP05-SS-QK0011-REG HR-104Q-GP05-DS-QK0012-REG	0-1 2-4			Metals and Explosives
HR-104Q-GP06	HR-104Q-GP06-SS-QK0013-REG HR-104Q-GP06-DS-QK0014-REG	0-1 2-4			Metals and Explosives
HR-104Q-GP07	HR-104Q-GP07-SS-QK0015-REG HR-104Q-GP07-DS-QK0016-REG	0-1 3-4			Metals and Explosives
HR-104Q-GP08	HR-104Q-GP08-SS-QK0017-REG HR-104Q-GP08-DS-QK0018-REG	0-1 3-4			Metals and Explosives
HR-104Q-GP09	HR-104Q-GP09-SS-QK0019-REG HR-104Q-GP09-DS-QK0020-REG	0-1 3-4			Metals and Explosives
HR-104Q-GP10	HR-104Q-GP10-SS-QK0021-REG HR-104Q-GP10-DS-QK0022-REG	0-1 2-4		HR-104Q-GP10-DS-QK0022-MS/MSD	Metals and Explosives
HR-104Q-GP11	HR-104Q-GP11-SS-QK0023-REG HR-104Q-GP11-DS-QK0024-REG	0-1 3-4			Metals and Explosives
HR-104Q-GP12	HR-104Q-GP12-SS-QK0025-REG HR-104Q-GP12-DS-QK0026-REG	0-1 3-4			Metals and Explosives
HR-104Q-GP13	HR-104Q-GP13-SS-QK0027-REG HR-104Q-GP13-DS-QK0028-REG	0-1 3-4			Metals and Explosives
HR-104Q-GP14	HR-104Q-GP14-SS-QK0029-REG HR-104Q-GP14-DS-QK0030-REG	0-1 3-4			Metals and Explosives

Table 3-2

**Soil Sample Designations and Analytical Parameters
Former Rifle/Machine Gun Range, Parcel 104Q
Fort McClellan, Calhoun County, Alabama**

(Page 2 of 2)

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples		Analytical Parameters
			Field Duplicates	MS/MSD	
HR-104Q-GP15	HR-104Q-GP15-SS-QK0031-REG	0-1			Metals and Explosives
	HR-104Q-GP15-DS-QK0032-REG	3-4			
HR-104Q-GP16	HR-104Q-GP16-SS-QK0033-REG	0-1			Metals and Explosives
	HR-104Q-GP16-DS-QK0034-REG	3-4			
HR-104Q-GP17	HR-104Q-GP17-SS-QK0035-REG	0-1			Metals and Explosives
	HR-104Q-GP17-DS-QK0036-REG	3-4			
HR-104Q-GP18	HR-104Q-GP18-SS-QK0037-REG	0-1			Metals and Explosives
	HR-104Q-GP18-DS-QK0038-REG	1-2	HR-104Q-GP18-DS-QK0039-FD		
HR-104Q-GP19	HR-104Q-GP19-SS-QK0040-REG	0-1			Metals and Explosives
	HR-104Q-GP19-DS-QK0041-REG	1-2			
HR-104Q-GP20	HR-104Q-GP20-SS-QK0042-REG	0-1			Metals and Explosives
	HR-104Q-GP20-DS-QK0043-REG	3-4			
HR-104Q-MW01	HR-104Q-MW01-SS-QK0044-REG	0-1	HR-104Q-MW01-SS-QK0045-FD		Metals and Explosives
	HR-104Q-MW01-DS-QK0046-REG	3-4			
HR-104Q-MW02	HR-104Q-MW02-SS-QK0047-REG	0-1			Metals and Explosives
	HR-104Q-MW02-DS-QK0048-REG	3-4			

FD - Field duplicate.

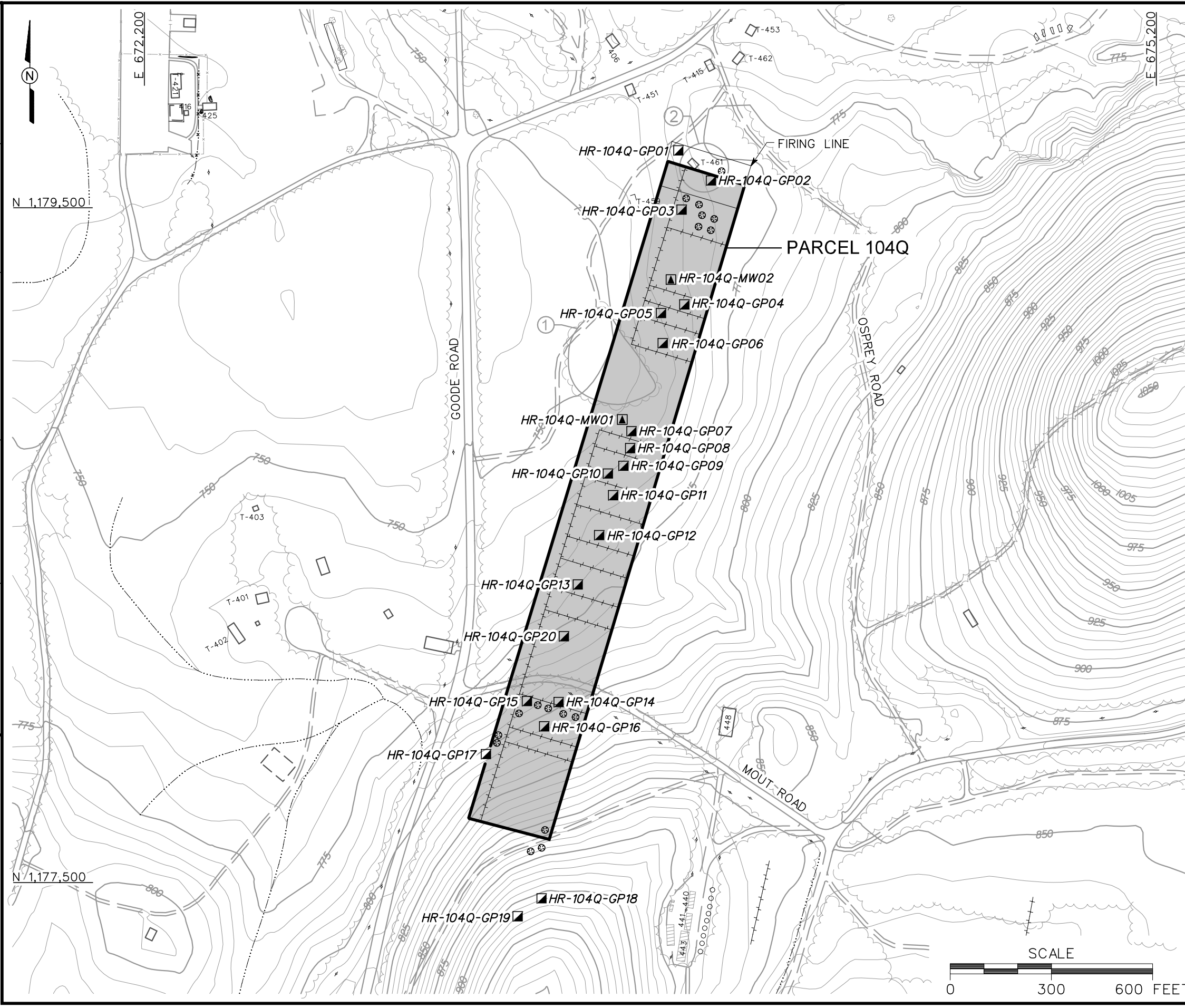
MS/MSD - Matrix spike/matrix spike duplicate.

QA/QC - Quality assurance/quality control.

REG - Field sample.

SVOC - Semivolatile organic compound.

VOC - Volatile organic compound.



LEGEND

UNIMPROVED ROADS AND PARKING

PAVED ROADS AND PARKING

BUILDING

TOPOGRAPHIC CONTOURS
(CONTOUR INTERVAL - 5 FOOT)

TREES / TREELINE

PARCEL BOUNDARY

FIRING LINE

SURFACE DRAINAGE / CREEK

UTILITY POLE

BERM

DEPRESSION (POSSIBLE FOXHOLE OR
TARGET BUNKERS)

SURFACE AND SUBSURFACE SOIL
SAMPLE LOCATION

MONITORING WELL / GROUNDWATER,
SURFACE AND SUBSURFACE SOIL
SAMPLE LOCATION

APPROXIMATE LOCATION OF OBSERVED FEATURES

CLEARED AREA IDENTIFIED ON
1982 AERIAL PHOTOGRAPH

GRAVEL AREA WITH UTILITY POLE

FIGURE 3-1

SAMPLE LOCATION MAP

FORMER RIFLE/MACHINE GUN RANGE

PARCEL 104Q

U. S. ARMY CORPS OF ENGINEERS

MOBILE DISTRICT

FORT McCLELLAN

CALHOUN COUNTY, ALABAMA

Contract No. DACA21-96-D-0018

Shaw Environmental, Inc.

1 and placed in the appropriate sample containers. Sample collection logs are included in
2 Appendix A. The samples were analyzed for the parameters listed in Table 3-2 using methods
3 outlined in Section 3.4.

4 5 **3.2.2 Subsurface Soil Sampling**

6 Subsurface soil samples were collected from 22 soil borings at the Former Rifle/Machine Gun
7 Range, Parcel 104Q, as shown on Figure 3-1. Subsurface soil sampling locations and rationale
8 are presented in Table 3-1. Sample designations, depths, and analytical parameters are listed in
9 Table 3-2. Soil boring locations were determined in the field by the on-site geologist based on
10 UXO avoidance activities, sampling rationale, presence of surface structures, and site
11 topography.

12
13 **Sample Collection.** Subsurface soil samples were collected from soil borings at depths
14 greater than one foot below ground surface (bgs) in the unsaturated zone. The soil borings were
15 advanced and soil samples collected using either a DPT sampling system or a stainless-steel hand
16 auger following procedures specified in the SAP. Sample collection logs are included in
17 Appendix A. The samples were analyzed for the parameters listed in Table 3-2 using methods
18 outlined in Section 3.4.

19
20 Subsurface soil samples were collected continuously to 4 feet bgs or until sampler refusal was
21 encountered. Samples were field screened using a PID to measure volatile organic vapors. The
22 sample displaying the highest reading was selected and sent to the laboratory for analysis;
23 however, at those locations where PID readings were below background, the deepest sample
24 interval above the saturated zone was submitted for analysis. As necessary, the soil fraction for
25 VOC analysis was collected directly from the sampler using three EnCore samplers. The
26 remaining soil was then transferred to a clean stainless-steel bowl, homogenized, and placed in
27 the appropriate sample containers. The on-site geologist constructed a detailed boring log for
28 each soil boring. The boring logs are included in Appendix B. At the completion of soil
29 sampling, boreholes were abandoned with bentonite pellets and hydrated with potable water,
30 following borehole abandonment procedures summarized in the SAP.

31 32 **3.2.3 Monitoring Well Installation**

33 Two permanent monitoring wells were installed in the saturated zone at the Former
34 Rifle/Machine Gun Range, Parcel 104Q, to collect groundwater samples for laboratory analysis.
35 The well locations are shown on Figure 3-1. Table 3-3 summarizes construction details of the
36 monitoring wells installed at the site. The well construction logs are included in Appendix B.

Table 3-3

**Monitoring Well Construction Summary
Former Rifle/Machine Gun Range, Parcel 104Q
Fort McClellan, Calhoun County, Alabama**

Well Location	Northing	Easting	Ground Elevation (ft amsl)	TOC Elevation (ft amsl)	Well Depth (ft bgs)	Screen Length (ft)	Screen Interval (ft bgs)	Well Material
HR-104Q-MW01	1178867.79	673621.32	762.04	764.22	30	15	15 - 30	2" ID Sch. 40 PVC
HR-104Q-MW02	1179282.59	673765.62	774.07	776.20	72.5	20	52.5 - 72.5	2" ID Sch. 40 PVC

Permanent wells installed using hollow-stem auger.

Horizontal coordinates referenced to the U.S. State Plane Coordinate System, Alabama East Zone, North American Datum of 1983.

Elevations referenced to the North American Vertical Datum of 1988.

2" ID Sch. 40 PVC - 2-inch inside diameter Schedule 40 polyvinyl chloride.

bgs - Below ground surface.

ft - Feet

amsl - Above mean sea level.

1
2 Shaw contracted Miller Drilling Company to install the permanent wells using a hollow-stem
3 auger drill rig at two of the DPT soil boring locations (HR-104Q-MW01 and HR-104Q-MW02).

4 The wells were installed following procedures outlined in the SAP. The borehole at each well
5 location was advanced with a 4.25-inch inside diameter (ID) hollow-stem auger from ground
6 surface to the saturated zone. The borehole was augered to the completion depth of the DPT
7 boring, and soil samples were collected at that depth to the bottom of the borehole. A 2-foot-
8 long, 2-inch ID carbon steel split-spoon sampler was driven at 5-foot intervals to collect
9 residuum for observing and describing lithology. The samples were logged to determine
10 lithologic changes and the approximate depth of groundwater encountered during drilling. This
11 information was used to determine the optimal placement of the monitoring well screen interval
12 and to provide site-specific geological and hydrogeological information. Soil characteristics
13 were described using the "Burmeister Identification System" described in Hunt (1986) and the
14 Unified Soil Classification System as outlined in American Society for Testing and Materials
15 (ASTM) Method D 2488 (ASTM, 2000). The boring logs are included in Appendix B.

16
17 Upon reaching the target depth in each borehole, a 15- or 20-foot length of 2-inch ID, 0.010-inch
18 continuous slot, Schedule 40 polyvinyl chloride (PVC) screen with a PVC end cap was placed
19 through the auger to the bottom of the borehole. The screen and end cap were attached to 2-inch
20 ID, flush-threaded Schedule 40 PVC riser. A filter pack consisting of Number 1 filter sand
21 (environmentally safe, clean fine sand, sieve size 20 to 40) was tremied around the well screen to
22 approximately 5 feet above the top of the well screen as the augers were removed. The filter
23 pack at monitoring well HR-104Q-MW02 also included an approximately 5-foot layer of extra-
24 fine filter sand (sieve size 30 to 70). The well was surged using a solid PVC surge block for
25 approximately 10 minutes or until no more settling of the filter sand occurred. A bentonite seal,
26 consisting of approximately 3 feet of bentonite pellets, was placed immediately on top of the
27 filter pack and hydrated with potable water. The bentonite seal placement and hydration
28 followed procedures in the SAP. Bentonite-cement grout was tremied into the remaining annular
29 space of the well from the top of the bentonite seal to the ground surface. A locking well cap
30 was placed on the PVC well riser. A protective steel casing was placed over the PVC well riser
31 and a concrete pad was constructed around the wellhead. Four protective steel posts were
32 installed around the well pad.

33
34 The monitoring wells were developed by surging and pumping with a submersible pump in
35 accordance with methodology outlined in the SAP. The submersible pump used for well
36 development was moved in an up-and-down fashion to encourage any residual well installation

1 materials to enter the well. These materials were then pumped out of the well to re-establish the
2 natural hydraulic flow conditions. Development continued until the water turbidity was less than
3 20 nephelometric turbidity units or for a maximum of 8 hours. The well development logs are
4 included in Appendix C.

6 **3.2.4 Water Level Measurements**

7 The depth to groundwater was measured in the permanent wells at the site on July 26, 2002,
8 following procedures outlined in the SAP. Depth to groundwater was measured with an
9 electronic water-level meter. The meter probe and cable were cleaned before use at each well
10 following decontamination methodology presented in the SAP. Measurements were referenced
11 to the top of the PVC well casing, as summarized in Table 3-4.

13 **3.2.5 Groundwater Sampling**

14 Groundwater samples were collected from both of the monitoring wells installed at the Former
15 Rifle/Machine Gun Range, Parcel 104Q. The well/groundwater sample locations are shown on
16 Figure 3-1. The groundwater sampling locations and rationale are listed in Table 3-1. The
17 groundwater sample designations and analytical parameters are listed in Table 3-5.

19 **Sample Collection.** The groundwater samples were collected using a bladder pump equipped
20 with Teflon[™] tubing, following the procedures outlined in the SAP. Groundwater samples were
21 collected after purging a minimum of three well volumes and after field parameters (temperature,
22 pH, dissolved oxygen, specific conductivity, oxidation-reduction potential, and turbidity)
23 stabilized. At monitoring well HR-104Q-MW02, the turbidity remained moderately elevated
24 (125 nephelometric turbidity units) despite the implementation of low-flow purging. Therefore,
25 the sample fraction for metals analysis collected from this well was decanted following
26 procedures in the the SAP. Field parameters were measured using a calibrated water-quality
27 meter, as summarized in Table 3-6. Sample collection logs are included in Appendix A. The
28 samples were analyzed for the parameters listed in Table 3-5 using methods outlined in Section
29 3.4.

31 **3.3 Surveying of Sample Locations**

32 Sample locations were surveyed using global positioning system and conventional civil survey
33 techniques described in the SAP. Horizontal coordinates were referenced to the U.S. State Plane
34 Coordinate System, Alabama East Zone, North American Datum of 1983. Elevations were
35 referenced to the North American Vertical Datum of 1988. Horizontal coordinates and
36 elevations are included in Appendix D.

Table 3-4

**Groundwater Elevations
Former Rifle/Machine Gun Range, Parcel 104Q
Fort McClellan, Calhoun County, Alabama**

Well Location	Date	Depth to Water (ft BTOC)	Top of Casing Elevation (ft amsl)	Ground Elevation (ft amsl)	Groundwater Elevation (ft amsl)
HR-104Q-MW01	26-Jul-02	NA	764.22	762.04	NA
HR-104Q-MW02	26-Jul-02	47.33	776.20	774.07	728.87

Elevations referenced to the North American Vertical Datum of 1988 (NAVD88).

amsl - Above mean sea level.

BTOC - Below top of casing.

ft - Feet.

NA - Not available, well was dry.

Table 3-5

**Groundwater Sample Designations and Analytical Parameters
Former Rifle/Machine Gun Range, Parcel 104Q
Fort McClellan, Calhoun County, Alabama**

Sample Location	Sample Designation	QA/QC Samples		Analytical Parameters
		Field Duplicates	MS/MSD	
HR-104Q-MW01	HR-104Q-MW01-GW-QK3001-REG	HR-104Q-MW01-GW-QK3002-FD		Metals, VOCs, SVOCs, Explosives, Pesticides, and Herbicides
HR-104Q-MW02	HR-104Q-MW02-GW-QK3003-REG		HR-104Q-MW02-GW-QK3003-MS/MSD	Metals and Explosives

FD - Field duplicate.

MS/MSD - Matrix spike/matrix spike duplicate.

QA/QC - Quality assurance/quality control.

REG - Field sample.

SVOC - Semivolatile organic compound.

VOC - Volatile organic compound.

Table 3-6

**Groundwater Field Parameters
Former Rifle/Machine Gun Range, Parcel 104Q
Fort McClellan, Calhoun County, Alabama**

Sample Location	Sample Date	Specific Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	ORP (mV)	Temperature (°C)	Turbidity (NTU)	pH (SU)
HR-104Q-MW01	20-Jun-02	0.030	6.38	238	17.2	5.7	5.11
HR-104Q-MW02	21-Jun-02	0.203	7.35	256	21.2	125	7.35

°C - Degrees Celsius.

mg/L - Milligrams per liter.

mS/cm - Millisiemens per centimeter.

mV - Millivolts.

NTU - Nephelometric turbidity units.

ORP - Oxidation-reduction potential.

SU - Standard units.

3.4 Analytical Program

Samples collected during the SI were analyzed for various chemical parameters based on potential site-specific chemicals and on EPA, ADEM, FTMC, and USACE requirements.

Samples collected at the Former Rifle/Machine Gun Range, Parcel 104Q, were analyzed for the following parameters using EPA SW-846 methods, including Update III methods where applicable:

- Target analyte list metals – EPA Method 6010B/7000
- Nitroaromatic/nitramine explosives – EPA Method 8330.

Approximately ten percent of the samples were analyzed for the following additional parameters:

- VOCs – EPA Method 8260B
- Semivolatile organic compounds (SVOC) – EPA Method 8270C
- Chlorinated herbicides – EPA Method 8151A
- Chlorinated pesticides – EPA Method 8081A
- Organophosphorous pesticides – EPA Method 8141A.

3.5 Sample Preservation, Packaging, and Shipping

Sample preservation, packaging, and shipping followed requirements specified in the SAP.

Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SI are listed in the SAP. Sample documentation and chain-of-custody records were completed as specified in the SAP.

Completed analysis request and chain-of-custody records (Appendix A) were secured and included with each shipment of sample coolers to EMAX Laboratories, Inc. in Torrance, California.

3.6 Investigation-Derived Waste Management and Disposal

Investigation-derived waste (IDW) was managed and disposed as outlined in the SAP. The IDW generated during the SI at the Former Rifle/Machine Gun Range, Parcel 104Q, was segregated as follows:

- Drill cuttings
- Purge water from well development, sampling activities, and decontamination fluids
- Spent well materials and personal protective equipment.

Solid IDW was stored inside the fenced area surrounding Buildings 335 and 336 in lined roll-off bins prior to characterization and final disposal. Solid IDW was characterized using toxicity characteristic leaching procedure analysis. Based on the results, drill cuttings, spent well materials, and personal protective equipment generated during the SI were disposed as nonhazardous waste at the Three Corners Landfill in Piedmont, Alabama.

Liquid IDW was contained in the 20,000-gallon sump associated with the Building T-338 vehicle washrack. Liquid IDW was characterized by VOC, SVOC, and metals analyses. Based on the analyses, liquid IDW was discharged as nonhazardous waste to the FTMC wastewater treatment plant on the Main Post.

3.7 Variances/Nonconformances

No variances or nonconformances to the SFSP were recorded during completion of the SI at the Former Rifle/Machine Gun Range, Parcel 104Q.

3.8 Data Quality

The field sample analytical data are presented in tabular form in Appendix E. The field samples were collected, documented, handled, analyzed, and reported in a manner consistent with the SI work plan, the FTMC SAP and quality assurance plan, and standard, accepted methods and procedures. Data were reported and evaluated in accordance with Corps of Engineers South Atlantic Savannah Level B criteria (USACE, 2001b) and the stipulated requirements for the generation of definitive data presented in the SAP. Chemical data were reported by the laboratory via hard-copy data packages using Contract Laboratory Program-like forms.

Data Validation. The reported analytical data were validated in accordance with EPA National Functional Guidelines by Level III criteria. The data validation results are summarized in a quality assurance report, which includes the data validation summary report (Appendix F). Selected results were qualified based on the implementation of accepted data validation procedures and practices. These qualified parameters are highlighted in the report. The validation-assigned qualifiers were added to the FTMC Shaw Environmental Management

1 System™ database for tracking and reporting. The qualified data were used in comparisons to
2 the SSSLs and ESVs. Rejected data (assigned an "R" qualifier) were not used in the comparisons
3 to the SSSLs and ESVs. The data presented in this report, except where qualified, meet the
4 principal data quality objective for this SI.
5

4.0 Site Characterization

Subsurface investigations performed at the Former Rifle/Machine Gun Range, Parcel 104Q, provided soil, geologic, and groundwater data used to characterize the geology and hydrogeology of the site.

4.1 Regional and Site Geology

4.1.1 Regional Geology

Calhoun County includes parts of two physiographic provinces: the Piedmont Upland Province and the Valley and Ridge Province. The Piedmont Upland Province occupies the extreme eastern and southeastern portions of the county and is characterized by metamorphosed sedimentary rocks. The generally accepted range in age of these metamorphics is Cambrian to Devonian.

The majority of Calhoun County, including the Main Post of FTMC, lies within the Appalachian fold-and-thrust structural belt (Valley and Ridge Province) where southeastward-dipping thrust faults with associated minor folding are the predominant structural features. The fold-and-thrust belt consists of Paleozoic sedimentary rocks that have been asymmetrically folded and thrust-faulted, with major structures and faults striking in a northeast-southwest direction.

Northwestward transport of the Paleozoic rock sequence along the thrust faults has resulted in the imbricate stacking of large slabs of rock referred to as thrust sheets. Within an individual thrust sheet, smaller faults may splay off the larger thrust fault, resulting in imbricate stacking of rock units within an individual thrust sheet (Osborne and Szabo, 1984). Geologic contacts in this region generally strike parallel to the faults, and repetition of lithologic units is common in vertical sequences. Geologic formations within the Valley and Ridge Province portion of Calhoun County have been mapped by Warman and Causey (1962), Osborne and Szabo (1984), and Moser and DeJarnette (1992) and vary in age from Lower Cambrian to Pennsylvanian.

The basal unit of the sedimentary sequence in Calhoun County is the Cambrian Chilhowee Group. The Chilhowee Group consists of the Cochran, Nichols, Wilson Ridge, and Weisner Formations (Osborne and Szabo, 1984), but in Calhoun County it is either undifferentiated or divided into the Cochran and Nichols Formations and an upper, undifferentiated Wilson Ridge and Weisner Formation. The Cochran is composed of poorly sorted arkosic sandstone and

1 conglomerate with interbeds of greenish gray siltstone and mudstone. Massive to laminated
2 greenish gray and black mudstone makes up the Nichols Formation, with thin interbeds of
3 siltstone and very fine-grained sandstone (Osborne et al., 1988). These two formations are
4 mapped only in the eastern part of the county.

5
6 The Wilson Ridge and Weisner Formations are undifferentiated in Calhoun County and consist
7 of both coarse-grained and fine-grained clastics. The coarse-grained facies appears to dominate
8 the unit and consists primarily of coarse-grained, vitreous quartzite and friable, fine- to coarse-
9 grained, orthoquartzitic sandstone, both of which locally contain conglomerate. The fine-grained
10 facies consists of sandy and micaceous shale and silty, micaceous mudstone, which are locally
11 interbedded with the coarse clastic rocks. The abundance of orthoquartzitic sandstone and
12 quartzite suggests that most of the Chilhowee Group bedrock in the vicinity of FTMC belongs to
13 the Weisner Formation (Osborne and Szabo, 1984).

14
15 The Cambrian Shady Dolomite overlies the Weisner Formation northeast, east, and southwest of
16 the Main Post and consists of interlayered bluish gray or pale yellowish gray sandy dolomitic
17 limestone and siliceous dolomite with coarsely crystalline, porous chert (Osborne et al., 1989). A
18 variegated shale and clayey silt have been included within the lower part of the Shady Dolomite
19 (Cloud, 1966). Material similar to this lower shale unit was noted in core holes drilled by the
20 Alabama Geologic Survey on FTMC (Osborne and Szabo, 1984). The character of the Shady
21 Dolomite in the FTMC vicinity and the true assignment of the shale at this stratigraphic interval
22 are still uncertain (Osborne, 1999).

23
24 The Rome Formation overlies the Shady Dolomite and locally occurs to the northwest and
25 southeast of the Main Post, as mapped by Warman and Causey (1962) and Osborne and Szabo
26 (1984), and immediately to the west of Reilly Airfield (Osborne and Szabo, 1984). The Rome
27 Formation consists of variegated, thinly interbedded grayish red-purple mudstone, shale,
28 siltstone, and greenish red and light gray sandstone, with locally occurring limestone and
29 dolomite. Weaver Cave, located approximately one mile west of the northwest boundary of the
30 Main Post, is situated in gray dolomite and limestone mapped as the Rome Formation (Osborne
31 et al., 1997). The Conasauga Formation overlies the Rome Formation and occurs along anticlinal
32 axes in the northeastern portion of Pelham Range (Warman and Causey, 1962; Osborne and
33 Szabo, 1984) and the northern portion of the Main Post (Osborne et al., 1997). The Conasauga
34 Formation is composed of dark gray, finely to coarsely crystalline, medium- to thick-bedded
35 dolomite with minor shale and chert (Osborne et al., 1989).

1 Overlying the Conasauga Formation is the Knox Group, which is composed of the Copper Ridge
2 and Chepultepec dolomites of Cambro-Ordovician age. The Knox Group is undifferentiated in
3 Calhoun County and consists of light medium gray, fine to medium crystalline, variably bedded
4 to laminated, siliceous dolomite and dolomitic limestone that weather to a chert residuum
5 (Osborne and Szabo, 1984). The Knox Group underlies a large portion of the Pelham Range
6 area.

7
8 The Ordovician Newala and Little Oak Limestones overlie the Knox Group. The Newala
9 Limestone consists of light to dark gray, micritic, thick-bedded limestone with minor dolomite.
10 The Little Oak Limestone is comprised of dark gray, medium- to thick-bedded, fossiliferous,
11 argillaceous to silty limestone with chert nodules. These limestone units are mapped as
12 undifferentiated at FTMC and in other parts of Calhoun County. The Athens Shale overlies the
13 Ordovician limestone units. The Athens Shale consists of dark gray to black shale and graptolitic
14 shale with localized interbedded dark gray limestone (Osborne et al., 1989). These units occur
15 within an eroded “window” in the uppermost structural thrust sheet at FTMC and underlie much
16 of the developed area of the Main Post.

17
18 Other Ordovician-aged bedrock units mapped in Calhoun County include the Greensport
19 Formation, Colvin Mountain Sandstone, and Sequatchie Formation. These units consist of
20 various siltstones, sandstones, shales, dolomites, and limestones and are mapped as one,
21 undifferentiated unit in some areas of Calhoun County. The only Silurian-age sedimentary
22 formation mapped in Calhoun County is the Red Mountain Formation. This unit consists of
23 interbedded red sandstone, siltstone, and shale with greenish gray to red silty and sandy
24 limestone.

25
26 The Devonian Frog Mountain Sandstone consists of sandstone and quartzitic sandstone with
27 shale interbeds, dolomudstone, and glauconitic limestone (Osborne et al., 1988). This unit
28 locally occurs in the western portion of Pelham Range.

29
30 The Mississippian Fort Payne Chert and the Maury Formation overlie the Frog Mountain
31 Sandstone and are composed of dark to light gray limestone with abundant chert nodules and
32 greenish gray to grayish red phosphatic shale, with increasing amounts of calcareous chert
33 towards the upper portion of the formation (Osborne and Szabo, 1984). These units occur in the
34 northwestern portion of Pelham Range. Overlying the Fort Payne Chert is the Floyd Shale, also
35 of Mississippian age, which consists of thin-bedded, fissile brown to black shale with thin
36 intercalated limestone layers and interbedded sandstone. Osborne and Szabo (1984) reassigned

1 the Floyd Shale, which was mapped by Warman and Causey (1962) on the Main Post of FTMC,
2 to the Ordovician Athens Shale based on fossil data.

3
4 The Pennsylvanian Parkwood Formation overlies the Floyd Shale and consists of a medium to
5 dark gray, silty clay, shale, and mudstone with interbedded light to medium gray, very fine to fine
6 grained, argillaceous, micaceous sandstone. Locally the Parkwood Formation also contains beds
7 of medium to dark gray, argillaceous, bioclastic to cherty limestone and beds of clayey coal up to
8 a few inches thick (Raymond et al., 1988). The Parkwood Formation in Calhoun County is
9 generally found within a structurally complex area known as the Coosa deformed belt. In the
10 deformed belt, the Parkwood Formation and Floyd Shale are mapped as undifferentiated because
11 their lithologic similarity and significant deformation make it impractical to map the contact
12 (Thomas and Drahovzal, 1974; Osborne et al., 1988). The undifferentiated Parkwood Formation
13 and Floyd Shale are found throughout the western quarter of Pelham Range.

14
15 The Jacksonville thrust fault is the most significant structural geological feature in the vicinity of
16 the Main Post of FTMC, both for its role in determining the stratigraphic relationships in the area
17 and for its contribution to regional water supplies. The trace of the fault extends northeastward
18 for approximately 39 miles between Bynum, Alabama, and Piedmont, Alabama. The fault is
19 interpreted as a major splay of the Pell City fault (Osborne and Szabo, 1984). The Ordovician
20 sequence that makes up the Eden thrust sheet is exposed at FTMC through an eroded window, or
21 fenster, in the overlying thrust sheet. Rocks within the window display complex folding, with
22 the folds being overturned and tight to isoclinal. The carbonates and shales locally exhibit well-
23 developed cleavage (Osborne and Szabo, 1984). The FTMC window is framed on the northwest
24 by the Rome Formation; north by the Conasauga Formation; northeast, east, and southwest by the
25 Shady Dolomite; and southeast and southwest by the Chilhowee Group (Osborne et al., 1997).
26 Two small klippen of the Shady Dolomite, bounded by the Jacksonville fault, have been
27 recognized adjacent to the Pell City fault at the FTMC window (Osborne et al., 1997).

28
29 The Pell City fault serves as a fault contact between the bedrock within the FTMC window and
30 the Rome and Conasauga Formations. The trace of the Pell City fault is also exposed
31 approximately nine miles west of the FTMC window on Pelham Range, where it traverses
32 northeast to southwest across the western quarter of Pelham Range. Here, the trace of the Pell
33 City fault marks the boundary between the Pell City thrust sheet and the Coosa deformed belt.

1 The eastern three-quarters of Pelham Range is located within the Pell City thrust sheet, while the
2 remaining western quarter of Pelham Range is located within the Coosa deformed belt. The Pell
3 City thrust sheet is a large-scale thrust sheet containing Cambrian and Ordovician rocks and is
4 relatively less structurally complex than the Coosa deformed belt (Thomas and Neathery, 1982).
5 The Pell City thrust sheet is exposed between the traces of the Jacksonville and Pell City faults
6 along the western boundary of the FTMC window and along the trace of the Pell City fault on
7 Pelham Range (Thomas and Neathery, 1982; Osborne et al., 1988). The Coosa deformed belt is
8 a narrow northeast-to-southwest-trending linear zone of complex structure (approximately 5 to
9 20 miles wide and approximately 90 miles in length) consisting mainly of thin imbricate thrust
10 slices. The structure within these imbricate thrust slices is often internally complicated by small-
11 scale folding and additional thrust faults (Thomas and Drahovzal, 1974).

13 **4.1.2 Site Geology**

14 Soils at Former Rifle/Machine Gun Range, Parcel 104Q fall into three mapping units: Stony
15 rough land, sandstone (Ss) in the southern portion of the range; Anniston gravelly clay loam, 10
16 to 15 percent slopes, severely eroded (AbD3) in the central portion of the range, and Anniston
17 gravelly clay loam, 6 to 10 percent slopes, severely eroded (AbC3) in the northern portion of the
18 range (U.S. Department of Agriculture [USDA], 1961).

20 The Stony rough land, sandstone consists of medium to strongly acidic, shallow or stony, well-
21 drained, friable soils with many outcrops of sandstone and quartzite bedrock, loose rock fragments,
22 and scattered patches of sandy soil material. It is found in rough mountainous areas with slopes
23 generally greater than 25 percent (USDA, 1961).

25 The Anniston Series soils consist of medium to strongly acidic, deep, well-drained, friable soils
26 that have developed in old local alluvium from weathered sandstone, shale, and quartzite.
27 Sandstone and quartzite gravel and cobbles are common throughout the soil. The typical soil
28 description is dark brown to red or dark reddish-brown gravelly clay loam from which most of
29 the original surface soil has been lost to erosion. The subsoil is described as a clay loam or silty
30 clay loam (USDA, 1961).

32 Bedrock at Parcel 104Q is mapped as Cambrian Shady Dolomite, which consists of interlayered
33 bluish gray or pale yellowish gray sandy dolomitic limestone and siliceous dolomite with
34 coarsely crystalline, porous chert (Osborne et al., 1989).

36 The residuum encountered during drilling activities at the Former Rifle/Machine Gun Range,

1 Parcel 104Q, consisted of medium brown to dark reddish-brown clay or clay and silt mixture
2 with varying amounts of sand and sandstone gravel in shallow borings in the northern and central
3 portions of the parcel. This description is consistent with the Anniston Series soils. The
4 residuum in the deeper borings consisted of reddish-brown to yellowish orange to light gray clay
5 or reddish-brown to yellowish orange sand and clay. The residuum encountered in the shallow
6 borings in the southern portion of the parcel consisted predominately of reddish-brown sand and
7 clay mixtures. Bedrock was not encountered during drilling activities at Parcel 104Q.

8 9 **4.2 Site Hydrology**

10 11 **4.2.1 Surface Hydrology**

12 Precipitation in the form of rainfall averages about 53 inches annually in Anniston, Alabama,
13 with infiltration rates annually exceeding evapotranspiration rates (U.S. Department of
14 Commerce, 1998). The major surface water features at the Main Post of FTMC include
15 Remount Creek, Cane Creek, and Cave Creek. These waterways flow in a general northwest to
16 westerly direction towards the Coosa River on the western boundary of Calhoun County.

17
18 Elevation of the Former Rifle/Machine Gun Range, Parcel 104Q, ranges from approximately 750
19 to 875 feet above mean sea level. Surface water runoff in the vicinity of Parcel 104Q appears to
20 flow from the southeast to the northwest from the range.

21 22 **4.2.2 Hydrogeology**

23 Groundwater was encountered during drilling activities at 20 feet bgs in HR-104Q-MW01 and at
24 60 feet bgs in HR-104Q-MW02. Static groundwater levels were measured in monitoring wells at
25 Parcel 104Q on July 26, 2002, as summarized in Table 3-4. Groundwater elevations were
26 calculated by measuring the depth to groundwater relative to the surveyed top-of-casing
27 elevations. As shown in Table 3-4, groundwater was not present at HR-104Q-MW01 when static
28 groundwater levels were measured. At HR-104Q-MW02, the static groundwater level was 47.3
29 feet below top of casing. Based on the comparison of static groundwater levels to groundwater
30 levels observed during drilling activities, groundwater appears to be under confined or semi-
31 confined conditions in the residuum at HR-104Q-MW02.

32
33 Based on water level data from monitoring wells in the vicinity of Parcel 104Q, the groundwater
34 elevation tends to correspond with topography. The groundwater flow direction appears to be to
35 the northwest.

5.0 Summary of Analytical Results

The results of the chemical analysis of samples collected at the Former Rifle/Machine Gun Range, Parcel 104Q, indicate that metals, VOCs, pesticides, and one herbicide were detected in site media. SVOCs and explosive compounds were not detected in any of the samples collected at the site. To evaluate whether the detected constituents present an unacceptable risk to human health and the environment, the analytical results were compared to the human health SSSLs and ESVs for FTMC. The SSSLs and ESVs were developed by Shaw for human health and ecological risk evaluations as part of the ongoing SIs being performed under the BRAC Environmental Restoration Program at FTMC. A preliminary human health risk assessment (PRA) and a preliminary ecological risk assessment (PERA) were also performed to further characterize the potential threat to human health and ecological receptors, respectively.

Metals concentrations exceeding the SSSLs and ESVs were subsequently compared to metals background screening values to determine if the metals concentrations are within natural background concentrations (SAIC, 1998). Site metals data were further evaluated using statistical and geochemical methods to select site-related metals (Appendix G).

The following sections and Tables 5-1 through 5-3 summarize the results of the comparison of detected constituents to the SSSLs, ESVs, and background screening values. Complete analytical results are presented in Appendix E.

5.1 Surface Soil Analytical Results

Twenty-two surface soil samples were collected for chemical analysis at the Former Rifle/Machine Gun Range, Parcel 104Q. Surface soil samples were collected from the uppermost foot of soil at the locations shown on Figure 3-1. Analytical results were compared to residential human health SSSLs, ESVs, and metals background screening values, as presented in Table 5-1.

Metals. A total of 18 metals were detected in the surface soil samples collected at the site. The concentrations of five metals (aluminum, arsenic, chromium, iron, and manganese) exceeded their respective SSSLs. Of these, concentrations of aluminum, chromium, and manganese also exceeded their respective background concentrations in one or more samples:

Table 5-1

Surface Soil Analytical Results
Former Rifle/Machine Gun Range, Parcel 104Q
Fort McClellan, Calhoun County, Alabama

(Page 1 of 9)

Sample Location Sample Number Sample Date Sample Depth (Feet)					HR-104Q-GP01 QK0001 13-Jun-02 0- 1					HR-104Q-GP02 QK0004 18-Jun-02 0- 1					HR-104Q-GP03 QK0006 18-Jun-02 0- 1				
Parameter	Units	BKG ^a	SSSL ^b	ESV ^b	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV
METALS																			
Aluminum	mg/kg	1.63E+04	7.80E+03	5.00E+01	9.55E+03			YES	YES	1.32E+04			YES	YES	1.21E+04			YES	YES
Arsenic	mg/kg	1.37E+01	4.26E-01	1.00E+01	2.69E+00			YES		3.83E+00			YES		3.94E+00			YES	
Barium	mg/kg	1.24E+02	5.47E+02	1.65E+02	3.92E+01					9.91E+01					1.01E+02				
Beryllium	mg/kg	8.00E-01	9.60E+00	1.10E+00	ND					5.90E-01	J				5.37E-01	J			
Calcium	mg/kg	1.72E+03	NA	NA	1.45E+03	J				3.18E+02					3.41E+02				
Chromium	mg/kg	3.70E+01	2.32E+01	4.00E-01	8.20E+00				YES	8.51E+00				YES	7.43E+01		YES	YES	YES
Cobalt	mg/kg	1.52E+01	4.68E+02	2.00E+01	1.84E+00	J				4.44E+00					4.31E+00				
Copper	mg/kg	1.27E+01	3.13E+02	4.00E+01	4.51E+00					6.06E+00					4.24E+00				
Iron	mg/kg	3.42E+04	2.34E+03	2.00E+02	6.89E+03			YES	YES	7.56E+03			YES	YES	1.24E+04			YES	YES
Lead	mg/kg	4.01E+01	4.00E+02	5.00E+01	1.57E+01					2.23E+01					2.23E+01				
Magnesium	mg/kg	1.03E+03	NA	4.40E+05	7.09E+02					4.07E+02					3.09E+02				
Manganese	mg/kg	1.58E+03	3.63E+02	1.00E+02	1.70E+02	J			YES	1.07E+03			YES	YES	9.32E+02			YES	YES
Mercury	mg/kg	8.00E-02	2.33E+00	1.00E-01	4.70E-02	J				4.68E-02	J				4.62E-02	J			
Nickel	mg/kg	1.03E+01	1.54E+02	3.00E+01	4.09E+00					5.49E+00					5.27E+00				
Potassium	mg/kg	8.00E+02	NA	NA	3.07E+02	J				3.82E+02	J				2.81E+02	J			
Sodium	mg/kg	6.34E+02	NA	NA	5.80E+01	J				6.33E+01	J				6.96E+01	J			
Vanadium	mg/kg	5.88E+01	5.31E+01	2.00E+00	1.32E+01				YES	1.54E+01				YES	2.13E+01				YES
Zinc	mg/kg	4.06E+01	2.34E+03	5.00E+01	1.95E+01					1.73E+01					1.67E+01				
VOLATILE ORGANIC COMPOUNDS																			
2-Butanone	mg/kg	NA	4.66E+03	8.96E+01	3.20E-02	J				NR					1.80E-02	J			
Acetone	mg/kg	NA	7.76E+02	2.50E+00	7.90E-01	J				NR					2.20E-01	J			
p-Cymene	mg/kg	NA	1.55E+03	NA	1.80E-03	J				NR					ND				
PESTICIDES																			
4,4'-DDE	mg/kg	NA	1.79E+00	2.50E-03	2.40E-03	J				NR					ND				
4,4'-DDT	mg/kg	NA	1.79E+00	2.50E-03	2.80E-03	J			YES	NR					ND				
Dieldrin	mg/kg	NA	3.88E-02	5.00E-04	3.50E-03	J			YES	NR					ND				
Endosulfan II	mg/kg	NA	4.66E+01	1.19E-01	2.40E-03	J				NR					ND				
Endrin	mg/kg	NA	2.32E+00	1.00E-03	1.90E-03	J			YES	NR					ND				
alpha-Chlordane	mg/kg	NA	1.69E+00	1.00E-01	6.80E-04	J				NR					ND				
delta-BHC	mg/kg	NA	2.33E+00	9.94E+00	3.40E-04	J				NR					ND				
HERBICIDES																			
MCPA	mg/kg	NA	3.88E+00	1.00E-01	9.30E-01	J			YES	NR					ND				

Table 5-1

Surface Soil Analytical Results
Former Rifle/Machine Gun Range, Parcel 104Q
Fort McClellan, Calhoun County, Alabama

(Page 2 of 9)

Sample Location Sample Number Sample Date Sample Depth (Feet)					HR-104Q-GP04 QK0009 13-Jun-02 0- 1					HR-104Q-GP05 QK0011 13-Jun-02 0- 1					HR-104Q-GP06 QK0013 13-Jun-02 0- 1				
Parameter	Units	BKG ^a	SSSL ^b	ESV ^b	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV
METALS																			
Aluminum	mg/kg	1.63E+04	7.80E+03	5.00E+01	1.75E+04		YES	YES	YES	1.82E+04		YES	YES	YES	7.06E+03				YES
Arsenic	mg/kg	1.37E+01	4.26E-01	1.00E+01	4.44E+00			YES		4.45E+00			YES		2.16E+00			YES	
Barium	mg/kg	1.24E+02	5.47E+02	1.65E+02	3.79E+01					4.59E+01					6.30E+01				
Beryllium	mg/kg	8.00E-01	9.60E+00	1.10E+00	ND					ND					ND				
Calcium	mg/kg	1.72E+03	NA	NA	3.68E+02	J				4.83E+02	J				5.78E+02	J			
Chromium	mg/kg	3.70E+01	2.32E+01	4.00E-01	1.67E+01				YES	1.62E+01				YES	7.14E+00				YES
Cobalt	mg/kg	1.52E+01	4.68E+02	2.00E+01	2.65E+00					1.90E+00	J				3.22E+00				
Copper	mg/kg	1.27E+01	3.13E+02	4.00E+01	5.42E+00					5.84E+00					3.35E+00				
Iron	mg/kg	3.42E+04	2.34E+03	2.00E+02	1.70E+04			YES	YES	1.66E+04			YES	YES	5.67E+03			YES	YES
Lead	mg/kg	4.01E+01	4.00E+02	5.00E+01	2.57E+01					1.94E+01					1.92E+01				
Magnesium	mg/kg	1.03E+03	NA	4.40E+05	3.60E+02					4.16E+02					2.05E+02				
Manganese	mg/kg	1.58E+03	3.63E+02	1.00E+02	2.64E+02	J			YES	1.77E+02	J			YES	7.23E+02	J		YES	YES
Mercury	mg/kg	8.00E-02	2.33E+00	1.00E-01	8.59E-02	J	YES			7.51E-02	J				3.89E-02	J			
Nickel	mg/kg	1.03E+01	1.54E+02	3.00E+01	6.70E+00					6.86E+00					3.40E+00	B			
Potassium	mg/kg	8.00E+02	NA	NA	4.24E+02	J				4.40E+02	J				2.44E+02	J			
Sodium	mg/kg	6.34E+02	NA	NA	6.20E+01	J				5.85E+01	J				ND				
Vanadium	mg/kg	5.88E+01	5.31E+01	2.00E+00	3.27E+01				YES	3.25E+01				YES	1.12E+01				YES
Zinc	mg/kg	4.06E+01	2.34E+03	5.00E+01	1.89E+01					1.70E+01					1.24E+01				
VOLATILE ORGANIC COMPOUNDS																			
2-Butanone	mg/kg	NA	4.66E+03	8.96E+01	NR					NR					NR				
Acetone	mg/kg	NA	7.76E+02	2.50E+00	NR					NR					NR				
p-Cymene	mg/kg	NA	1.55E+03	NA	NR					NR					NR				
PESTICIDES																			
4,4'-DDE	mg/kg	NA	1.79E+00	2.50E-03	NR					NR					NR				
4,4'-DDT	mg/kg	NA	1.79E+00	2.50E-03	NR					NR					NR				
Dieldrin	mg/kg	NA	3.88E-02	5.00E-04	NR					NR					NR				
Endosulfan II	mg/kg	NA	4.66E+01	1.19E-01	NR					NR					NR				
Endrin	mg/kg	NA	2.32E+00	1.00E-03	NR					NR					NR				
alpha-Chlordane	mg/kg	NA	1.69E+00	1.00E-01	NR					NR					NR				
delta-BHC	mg/kg	NA	2.33E+00	9.94E+00	NR					NR					NR				
HERBICIDES																			
MCPA	mg/kg	NA	3.88E+00	1.00E-01	NR					NR					NR				

Table 5-1

Surface Soil Analytical Results
Former Rifle/Machine Gun Range, Parcel 104Q
Fort McClellan, Calhoun County, Alabama

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Sample Location Sample Number Sample Date Sample Depth (Feet)					HR-104Q-GP07 QK0015 26-Apr-02 0- 1					HR-104Q-GP08 QK0017 14-Jun-02 0- 1					HR-104Q-GP09 QK0019 14-Jun-02 0- 1				
Parameter	Units	BKG ^a	SSSL ^b	ESV ^b	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV
METALS																			
Aluminum	mg/kg	1.63E+04	7.80E+03	5.00E+01	1.60E+04			YES	YES	1.50E+04			YES	YES	1.19E+04			YES	YES
Arsenic	mg/kg	1.37E+01	4.26E-01	1.00E+01	4.90E+00			YES		5.03E+00			YES		3.62E+00			YES	
Barium	mg/kg	1.24E+02	5.47E+02	1.65E+02	1.03E+02					1.54E+02		YES			8.01E+01				
Beryllium	mg/kg	8.00E-01	9.60E+00	1.10E+00	6.73E-01	J				6.97E-01	J				4.64E-01	J			
Calcium	mg/kg	1.72E+03	NA	NA	8.06E+02					5.54E+02					4.68E+02				
Chromium	mg/kg	3.70E+01	2.32E+01	4.00E-01	1.02E+01				YES	8.98E+00				YES	7.49E+00				YES
Cobalt	mg/kg	1.52E+01	4.68E+02	2.00E+01	6.34E+00					5.55E+00					4.88E+00				
Copper	mg/kg	1.27E+01	3.13E+02	4.00E+01	1.46E+01		YES			7.16E+00					4.95E+00				
Iron	mg/kg	3.42E+04	2.34E+03	2.00E+02	1.46E+04			YES	YES	1.13E+04			YES	YES	1.18E+04			YES	YES
Lead	mg/kg	4.01E+01	4.00E+01	5.00E+01	3.88E+01					4.29E+01		YES			2.47E+01				
Magnesium	mg/kg	1.03E+03	NA	4.40E+05	5.74E+02					4.24E+02					2.98E+02				
Manganese	mg/kg	1.58E+03	3.63E+02	1.00E+02	1.63E+03		YES	YES	YES	2.40E+03		YES	YES	YES	1.42E+03			YES	YES
Mercury	mg/kg	8.00E-02	2.33E+00	1.00E-01	9.91E-02	J	YES			7.24E-02	J				4.59E-02	J			
Nickel	mg/kg	1.03E+01	1.54E+02	3.00E+01	8.33E+00					7.03E+00					5.46E+00				
Potassium	mg/kg	8.00E+02	NA	NA	5.47E+02					4.64E+02	J				3.84E+02	B			
Sodium	mg/kg	6.34E+02	NA	NA	6.47E+01	J				6.63E+01	J				7.85E+01	J			
Vanadium	mg/kg	5.88E+01	5.31E+01	2.00E+00	2.76E+01				YES	1.93E+01				YES	1.90E+01				YES
Zinc	mg/kg	4.06E+01	2.34E+03	5.00E+01	2.20E+01					2.24E+01	J				1.62E+01	J			
VOLATILE ORGANIC COMPOUNDS																			
2-Butanone	mg/kg	NA	4.66E+03	8.96E+01	NR					NR					NR				
Acetone	mg/kg	NA	7.76E+02	2.50E+00	NR					NR					NR				
p-Cymene	mg/kg	NA	1.55E+03	NA	NR					NR					NR				
PESTICIDES																			
4,4'-DDE	mg/kg	NA	1.79E+00	2.50E-03	NR					NR					NR				
4,4'-DDT	mg/kg	NA	1.79E+00	2.50E-03	NR					NR					NR				
Dieldrin	mg/kg	NA	3.88E-02	5.00E-04	NR					NR					NR				
Endosulfan II	mg/kg	NA	4.66E+01	1.19E-01	NR					NR					NR				
Endrin	mg/kg	NA	2.32E+00	1.00E-03	NR					NR					NR				
alpha-Chlordane	mg/kg	NA	1.69E+00	1.00E-01	NR					NR					NR				
delta-BHC	mg/kg	NA	2.33E+00	9.94E+00	NR					NR					NR				
HERBICIDES																			
MCPA	mg/kg	NA	3.88E+00	1.00E-01	NR					NR					NR				

Table 5-1

Surface Soil Analytical Results
Former Rifle/Machine Gun Range, Parcel 104Q
Fort McClellan, Calhoun County, Alabama

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Sample Location Sample Number Sample Date Sample Depth (Feet)					HR-104Q-GP10 QK0021 14-Jun-02 0- 1					HR-104Q-GP11 QK0023 14-Jun-02 0- 1					HR-104Q-GP12 QK0025 14-Jun-02 0- 1				
Parameter	Units	BKG ^a	SSSL ^b	ESV ^b	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV
METALS																			
Aluminum	mg/kg	1.63E+04	7.80E+03	5.00E+01	1.39E+04			YES	YES	1.13E+04			YES	YES	9.07E+03			YES	YES
Arsenic	mg/kg	1.37E+01	4.26E-01	1.00E+01	3.98E+00			YES		3.32E+00			YES		2.87E+00			YES	
Barium	mg/kg	1.24E+02	5.47E+02	1.65E+02	6.88E+01					7.50E+01					6.56E+01				
Beryllium	mg/kg	8.00E-01	9.60E+00	1.10E+00	ND					4.54E-01	J				ND				
Calcium	mg/kg	1.72E+03	NA	NA	6.19E+02					2.90E+02					6.42E+02				
Chromium	mg/kg	3.70E+01	2.32E+01	4.00E-01	8.50E+00				YES	6.97E+00				YES	1.23E+01				YES
Cobalt	mg/kg	1.52E+01	4.68E+02	2.00E+01	4.97E+00					4.40E+00					2.69E+00				
Copper	mg/kg	1.27E+01	3.13E+02	4.00E+01	5.37E+00					5.43E+00					5.03E+00				
Iron	mg/kg	3.42E+04	2.34E+03	2.00E+02	1.37E+04			YES	YES	8.76E+03			YES	YES	8.69E+03			YES	YES
Lead	mg/kg	4.01E+01	4.00E+02	5.00E+01	2.01E+01					2.61E+01					3.11E+01				
Magnesium	mg/kg	1.03E+03	NA	4.40E+05	4.31E+02					3.41E+02					3.35E+02				
Manganese	mg/kg	1.58E+03	3.63E+02	1.00E+02	9.29E+02			YES	YES	1.22E+03			YES	YES	7.41E+02			YES	YES
Mercury	mg/kg	8.00E-02	2.33E+00	1.00E-01	6.29E-02	J				4.72E-02	J				4.64E-02	J			
Nickel	mg/kg	1.03E+01	1.54E+02	3.00E+01	5.58E+00					5.35E+00					4.52E+00				
Potassium	mg/kg	8.00E+02	NA	NA	3.33E+02	B				2.85E+02	B				2.82E+02	B			
Sodium	mg/kg	6.34E+02	NA	NA	6.50E+01	J				5.97E+01	J				6.81E+01	J			
Vanadium	mg/kg	5.88E+01	5.31E+01	2.00E+00	2.27E+01				YES	1.51E+01				YES	1.48E+01				YES
Zinc	mg/kg	4.06E+01	2.34E+03	5.00E+01	1.52E+01	J				1.62E+01	J				1.77E+01	J			
VOLATILE ORGANIC COMPOUNDS																			
2-Butanone	mg/kg	NA	4.66E+03	8.96E+01	NR					NR					NR				
Acetone	mg/kg	NA	7.76E+02	2.50E+00	NR					NR					NR				
p-Cymene	mg/kg	NA	1.55E+03	NA	NR					NR					NR				
PESTICIDES																			
4,4'-DDE	mg/kg	NA	1.79E+00	2.50E-03	NR					NR					NR				
4,4'-DDT	mg/kg	NA	1.79E+00	2.50E-03	NR					NR					NR				
Dieldrin	mg/kg	NA	3.88E-02	5.00E-04	NR					NR					NR				
Endosulfan II	mg/kg	NA	4.66E+01	1.19E-01	NR					NR					NR				
Endrin	mg/kg	NA	2.32E+00	1.00E-03	NR					NR					NR				
alpha-Chlordane	mg/kg	NA	1.69E+00	1.00E-01	NR					NR					NR				
delta-BHC	mg/kg	NA	2.33E+00	9.94E+00	NR					NR					NR				
HERBICIDES																			
MCPA	mg/kg	NA	3.88E+00	1.00E-01	NR					NR					NR				

Table 5-1

Surface Soil Analytical Results
Former Rifle/Machine Gun Range, Parcel 104Q
Fort McClellan, Calhoun County, Alabama

(Page 5 of 9)

Sample Location Sample Number Sample Date Sample Depth (Feet)					HR-104Q-GP13 QK0027 14-Jun-02 0- 1					HR-104Q-GP14 QK0029 17-Jun-02 0- 1					HR-104Q-GP15 QK0031 17-Jun-02 0- 1				
Parameter	Units	BKG ^a	SSSL ^b	ESV ^b	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV
METALS																			
Aluminum	mg/kg	1.63E+04	7.80E+03	5.00E+01	1.50E+04			YES	YES	1.81E+04		YES	YES	YES	1.67E+04		YES	YES	YES
Arsenic	mg/kg	1.37E+01	4.26E-01	1.00E+01	3.95E+00			YES		3.75E+00			YES		3.80E+00			YES	
Barium	mg/kg	1.24E+02	5.47E+02	1.65E+02	9.48E+01					3.10E+01					8.46E+01				
Beryllium	mg/kg	8.00E-01	9.60E+00	1.10E+00	5.28E-01	J				ND					4.76E-01	J			
Calcium	mg/kg	1.72E+03	NA	NA	4.66E+02					2.50E+02					6.73E+02				
Chromium	mg/kg	3.70E+01	2.32E+01	4.00E-01	8.20E+00				YES	9.39E+00				YES	8.91E+00				YES
Cobalt	mg/kg	1.52E+01	4.68E+02	2.00E+01	4.90E+00					3.56E+00					5.15E+00				
Copper	mg/kg	1.27E+01	3.13E+02	4.00E+01	1.62E+01		YES			7.12E+00					5.73E+00				
Iron	mg/kg	3.42E+04	2.34E+03	2.00E+02	9.49E+03			YES	YES	1.14E+04			YES	YES	1.14E+04			YES	YES
Lead	mg/kg	4.01E+01	4.00E+02	5.00E+01	4.60E+01		YES			2.07E+01					1.75E+01				
Magnesium	mg/kg	1.03E+03	NA	4.40E+05	5.47E+02					4.81E+02					5.67E+02				
Manganese	mg/kg	1.58E+03	3.63E+02	1.00E+02	1.70E+03		YES	YES	YES	2.56E+02				YES	8.31E+02			YES	YES
Mercury	mg/kg	8.00E-02	2.33E+00	1.00E-01	1.50E-01		YES		YES	8.85E-02	J	YES			6.24E-02	J			
Nickel	mg/kg	1.03E+01	1.54E+02	3.00E+01	8.68E+00					7.48E+00					7.58E+00				
Potassium	mg/kg	8.00E+02	NA	NA	4.33E+02	B				3.39E+02	B				5.84E+02				
Sodium	mg/kg	6.34E+02	NA	NA	6.76E+01	J				5.66E+01	J				6.39E+01	J			
Vanadium	mg/kg	5.88E+01	5.31E+01	2.00E+00	1.89E+01				YES	2.27E+01				YES	2.20E+01				YES
Zinc	mg/kg	4.06E+01	2.34E+03	5.00E+01	2.39E+01	J				1.52E+01	J				1.92E+01	J			
VOLATILE ORGANIC COMPOUNDS																			
2-Butanone	mg/kg	NA	4.66E+03	8.96E+01	NR					NR					NR				
Acetone	mg/kg	NA	7.76E+02	2.50E+00	NR					NR					NR				
p-Cymene	mg/kg	NA	1.55E+03	NA	NR					NR					NR				
PESTICIDES																			
4,4'-DDE	mg/kg	NA	1.79E+00	2.50E-03	NR					NR					NR				
4,4'-DDT	mg/kg	NA	1.79E+00	2.50E-03	NR					NR					NR				
Dieldrin	mg/kg	NA	3.88E-02	5.00E-04	NR					NR					NR				
Endosulfan II	mg/kg	NA	4.66E+01	1.19E-01	NR					NR					NR				
Endrin	mg/kg	NA	2.32E+00	1.00E-03	NR					NR					NR				
alpha-Chlordane	mg/kg	NA	1.69E+00	1.00E-01	NR					NR					NR				
delta-BHC	mg/kg	NA	2.33E+00	9.94E+00	NR					NR					NR				
HERBICIDES																			
MCPA	mg/kg	NA	3.88E+00	1.00E-01	NR					NR					NR				

Table 5-1

Surface Soil Analytical Results
Former Rifle/Machine Gun Range, Parcel 104Q
Fort McClellan, Calhoun County, Alabama

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Sample Location Sample Number Sample Date Sample Depth (Feet)					HR-104Q-GP16 QK0033 17-Jun-02 0- 1					HR-104Q-GP17 QK0035 17-Jun-02 0- 1					HR-104Q-GP18 QK0037 18-Jun-02 0- 1				
Parameter	Units	BKG ^a	SSSL ^b	ESV ^b	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV
METALS																			
Aluminum	mg/kg	1.63E+04	7.80E+03	5.00E+01	2.72E+04		YES	YES	YES	1.63E+04			YES	YES	6.26E+03				YES
Arsenic	mg/kg	1.37E+01	4.26E-01	1.00E+01	6.73E+00			YES		4.01E+00			YES		1.33E+00			YES	
Barium	mg/kg	1.24E+02	5.47E+02	1.65E+02	4.75E+01					6.22E+01					6.86E+01				
Beryllium	mg/kg	8.00E-01	9.60E+00	1.10E+00	4.22E-01 J					ND					3.65E-01 J				
Calcium	mg/kg	1.72E+03	NA	NA	4.18E+02					5.14E+02					3.04E+02				
Chromium	mg/kg	3.70E+01	2.32E+01	4.00E-01	2.82E+01			YES	YES	1.04E+01				YES	2.92E+00				YES
Cobalt	mg/kg	1.52E+01	4.68E+02	2.00E+01	2.43E+00					4.56E+00					2.33E+00				
Copper	mg/kg	1.27E+01	3.13E+02	4.00E+01	8.79E+00					4.55E+00					2.68E+00				
Iron	mg/kg	3.42E+04	2.34E+03	2.00E+02	2.31E+04			YES	YES	1.17E+04			YES	YES	2.79E+03			YES	YES
Lead	mg/kg	4.01E+01	4.00E+01	5.00E+01	1.08E+01					1.33E+01					8.36E+00				
Magnesium	mg/kg	1.03E+03	NA	4.40E+05	5.24E+02					4.50E+02					3.08E+02				
Manganese	mg/kg	1.58E+03	3.63E+02	1.00E+02	3.09E+02				YES	4.90E+02			YES	YES	3.71E+02			YES	YES
Mercury	mg/kg	8.00E-02	2.33E+00	1.00E-01	1.07E-01 J		YES		YES	5.16E-02 J					ND				
Nickel	mg/kg	1.03E+01	1.54E+02	3.00E+01	1.05E+01		YES			5.85E+00					3.22E+00				
Potassium	mg/kg	8.00E+02	NA	NA	4.32E+02 B					4.25E+02 B					1.33E+02 J				
Sodium	mg/kg	6.34E+02	NA	NA	6.65E+01 J					5.93E+01 J					5.88E+01 J				
Vanadium	mg/kg	5.88E+01	5.31E+01	2.00E+00	4.56E+01				YES	2.20E+01				YES	5.81E+00				YES
Zinc	mg/kg	4.06E+01	2.34E+03	5.00E+01	2.02E+01 J					1.68E+01 J					1.13E+01				
VOLATILE ORGANIC COMPOUNDS																			
2-Butanone	mg/kg	NA	4.66E+03	8.96E+01	NR					NR					NR				
Acetone	mg/kg	NA	7.76E+02	2.50E+00	NR					NR					NR				
p-Cymene	mg/kg	NA	1.55E+03	NA	NR					NR					NR				
PESTICIDES																			
4,4'-DDE	mg/kg	NA	1.79E+00	2.50E-03	NR					NR					NR				
4,4'-DDT	mg/kg	NA	1.79E+00	2.50E-03	NR					NR					NR				
Dieldrin	mg/kg	NA	3.88E-02	5.00E-04	NR					NR					NR				
Endosulfan II	mg/kg	NA	4.66E+01	1.19E-01	NR					NR					NR				
Endrin	mg/kg	NA	2.32E+00	1.00E-03	NR					NR					NR				
alpha-Chlordane	mg/kg	NA	1.69E+00	1.00E-01	NR					NR					NR				
delta-BHC	mg/kg	NA	2.33E+00	9.94E+00	NR					NR					NR				
HERBICIDES																			
MCPA	mg/kg	NA	3.88E+00	1.00E-01	NR					NR					NR				

Table 5-1

Surface Soil Analytical Results
Former Rifle/Machine Gun Range, Parcel 104Q
Fort McClellan, Calhoun County, Alabama

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Sample Location Sample Number Sample Date Sample Depth (Feet)					HR-104Q-GP19 QK0040 18-Jun-02 0- 1					HR-104Q-GP20 QK0042 17-Jun-02 0- 1				
Parameter	Units	BKG ^a	SSSL ^b	ESV ^b	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV
METALS														
Aluminum	mg/kg	1.63E+04	7.80E+03	5.00E+01	6.01E+03				YES	1.79E+04		YES	YES	YES
Arsenic	mg/kg	1.37E+01	4.26E-01	1.00E+01	1.46E+00			YES		4.40E+00			YES	
Barium	mg/kg	1.24E+02	5.47E+02	1.65E+02	6.83E+01					1.29E+02		YES		
Beryllium	mg/kg	8.00E-01	9.60E+00	1.10E+00	ND					6.38E-01	J			
Calcium	mg/kg	1.72E+03	NA	NA	2.02E+02					7.71E+02				
Chromium	mg/kg	3.70E+01	2.32E+01	4.00E-01	3.59E+00				YES	7.64E+00				YES
Cobalt	mg/kg	1.52E+01	4.68E+02	2.00E+01	2.55E+00					6.14E+00				
Copper	mg/kg	1.27E+01	3.13E+02	4.00E+01	2.23E+00					6.60E+00				
Iron	mg/kg	3.42E+04	2.34E+03	2.00E+02	2.80E+03			YES	YES	1.06E+04			YES	YES
Lead	mg/kg	4.01E+01	4.00E+02	5.00E+01	1.11E+01					3.32E+01				
Magnesium	mg/kg	1.03E+03	NA	4.40E+05	3.20E+02					5.63E+02				
Manganese	mg/kg	1.58E+03	3.63E+02	1.00E+02	3.72E+02			YES	YES	2.32E+03		YES	YES	YES
Mercury	mg/kg	8.00E-02	2.33E+00	1.00E-01	ND					9.64E-02	J	YES		
Nickel	mg/kg	1.03E+01	1.54E+02	3.00E+01	3.22E+00					8.77E+00				
Potassium	mg/kg	8.00E+02	NA	NA	2.10E+02	J				5.03E+02	J			
Sodium	mg/kg	6.34E+02	NA	NA	5.89E+01	J				5.73E+01	J			
Vanadium	mg/kg	5.88E+01	5.31E+01	2.00E+00	6.19E+00				YES	2.12E+01				YES
Zinc	mg/kg	4.06E+01	2.34E+03	5.00E+01	1.92E+01					2.11E+01				
VOLATILE ORGANIC COMPOUNDS														
2-Butanone	mg/kg	NA	4.66E+03	8.96E+01	NR					NR				
Acetone	mg/kg	NA	7.76E+02	2.50E+00	NR					NR				
p-Cymene	mg/kg	NA	1.55E+03	NA	NR					NR				
PESTICIDES														
4,4'-DDE	mg/kg	NA	1.79E+00	2.50E-03	NR					NR				
4,4'-DDT	mg/kg	NA	1.79E+00	2.50E-03	NR					NR				
Dieldrin	mg/kg	NA	3.88E-02	5.00E-04	NR					NR				
Endosulfan II	mg/kg	NA	4.66E+01	1.19E-01	NR					NR				
Endrin	mg/kg	NA	2.32E+00	1.00E-03	NR					NR				
alpha-Chlordane	mg/kg	NA	1.69E+00	1.00E-01	NR					NR				
delta-BHC	mg/kg	NA	2.33E+00	9.94E+00	NR					NR				
HERBICIDES														
MCPA	mg/kg	NA	3.88E+00	1.00E-01	NR					NR				

Table 5-1

Surface Soil Analytical Results
Former Rifle/Machine Gun Range, Parcel 104Q
Fort McClellan, Calhoun County, Alabama

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Sample Location Sample Number Sample Date Sample Depth (Feet)					HR-104Q-MW01 QK0044 23-Apr-02 0- 1					HR-104Q-MW02 QK0047 26-Apr-02 0- 1				
Parameter	Units	BKG ^a	SSSL ^b	ESV ^b	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV
METALS														
Aluminum	mg/kg	1.63E+04	7.80E+03	5.00E+01	1.37E+04			YES	YES	8.20E+03			YES	YES
Arsenic	mg/kg	1.37E+01	4.26E-01	1.00E+01	3.72E+00			YES		2.54E+00			YES	
Barium	mg/kg	1.24E+02	5.47E+02	1.65E+02	1.27E+02		YES			3.67E+01				
Beryllium	mg/kg	8.00E-01	9.60E+00	1.10E+00	7.72E-01	J				ND				
Calcium	mg/kg	1.72E+03	NA	NA	3.56E+02					2.14E+02				
Chromium	mg/kg	3.70E+01	2.32E+01	4.00E-01	7.93E+00				YES	3.36E+01			YES	YES
Cobalt	mg/kg	1.52E+01	4.68E+02	2.00E+01	6.06E+00					2.46E+00				
Copper	mg/kg	1.27E+01	3.13E+02	4.00E+01	6.50E+00					3.27E+00				
Iron	mg/kg	3.42E+04	2.34E+03	2.00E+02	1.08E+04			YES	YES	1.13E+04			YES	YES
Lead	mg/kg	4.01E+01	4.00E+02	5.00E+01	2.34E+01					8.98E+00				
Magnesium	mg/kg	1.03E+03	NA	4.40E+05	3.26E+02					1.90E+02				
Manganese	mg/kg	1.58E+03	3.63E+02	1.00E+02	1.98E+03		YES	YES	YES	1.38E+02				YES
Mercury	mg/kg	8.00E-02	2.33E+00	1.00E-01	4.43E-02	J				3.28E-02	J			
Nickel	mg/kg	1.03E+01	1.54E+02	3.00E+01	5.89E+00					3.08E+00				
Potassium	mg/kg	8.00E+02	NA	NA	3.17E+02	J				1.91E+02	J			
Sodium	mg/kg	6.34E+02	NA	NA	ND					ND				
Vanadium	mg/kg	5.88E+01	5.31E+01	2.00E+00	2.14E+01				YES	2.02E+01				YES
Zinc	mg/kg	4.06E+01	2.34E+03	5.00E+01	1.62E+01					7.40E+00				
VOLATILE ORGANIC COMPOUNDS														
2-Butanone	mg/kg	NA	4.66E+03	8.96E+01	NR					NR				
Acetone	mg/kg	NA	7.76E+02	2.50E+00	NR					NR				
p-Cymene	mg/kg	NA	1.55E+03	NA	NR					NR				
PESTICIDES														
4,4'-DDE	mg/kg	NA	1.79E+00	2.50E-03	NR					NR				
4,4'-DDT	mg/kg	NA	1.79E+00	2.50E-03	NR					NR				
Dieldrin	mg/kg	NA	3.88E-02	5.00E-04	NR					NR				
Endosulfan II	mg/kg	NA	4.66E+01	1.19E-01	NR					NR				
Endrin	mg/kg	NA	2.32E+00	1.00E-03	NR					NR				
alpha-Chlordane	mg/kg	NA	1.69E+00	1.00E-01	NR					NR				
delta-BHC	mg/kg	NA	2.33E+00	9.94E+00	NR					NR				
HERBICIDES														
MCPA	mg/kg	NA	3.88E+00	1.00E-01	NR					NR				

Table 5-1

**Surface Soil Analytical Results
Former Rifle/Machine Gun Range, Parcel 104Q
Fort McClellan, Calhoun County, Alabama**

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Analyses performed using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods.

^aBKG - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in SAIC, 1998,
Final Background Metals Survey Report, Fort McClellan, Alabama, July.

^b Residential human health site-specific screening level (SSSL) and ecological screening value (ESV) as given in IT, 2000,
Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama, July.

B - Analyte detected in laboratory or field blank at concentration greater than the reporting limit.

J - Compound was positively identified; reported value is an estimated concentration.

mg/kg - Milligrams per kilogram.

NA - Not available.

ND - Not detected.

NR - Not requested.

Qual - Data validation qualifier.

Table 5-2

**Subsurface Soil Analytical Results
Former Rifle/Machine Gun Range, Parcel 104Q
Fort McClellan, Calhoun County, Alabama**

(Page 1 of 6)

Sample Location Sample Number Sample Date Sample Depth (Feet)				HR-104Q-GP01 QK0003 13-Jun-02 2-4				HR-104Q-GP02 QK0005 18-Jun-02 3-4				HR-104Q-GP03 QK0007 18-Jun-02 3-4				HR-104Q-GP04 QK0010 13-Jun-02 2-4			
Parameter	Units	BKG ^a	SSSL ^b	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
METALS																			
Aluminum	mg/kg	1.36E+04	7.80E+03	2.27E+04		YES	YES	1.99E+04		YES	YES	1.79E+04		YES	YES	2.28E+04		YES	YES
Arsenic	mg/kg	1.83E+01	4.26E-01	4.46E+00			YES	5.05E+00			YES	3.31E+00			YES	5.84E+00			YES
Barium	mg/kg	2.34E+02	5.47E+02	4.07E+01				1.47E+02				6.00E+01				2.39E+01			
Beryllium	mg/kg	8.60E-01	9.60E+00	ND				1.27E+00		YES		ND				ND			
Calcium	mg/kg	6.37E+02	NA	4.53E+02	J			3.44E+02				5.06E+02				7.40E+01	J		
Chromium	mg/kg	3.83E+01	2.32E+01	1.51E+01				1.15E+01				1.22E+01				2.13E+01			
Cobalt	mg/kg	1.75E+01	4.68E+02	1.81E+00	J			5.90E+00				5.88E+00				1.99E+00	J		
Copper	mg/kg	1.94E+01	3.13E+02	6.20E+00				8.28E+00				5.56E+00				7.58E+00			
Iron	mg/kg	4.48E+04	2.34E+03	1.64E+04			YES	1.04E+04			YES	1.30E+04			YES	2.52E+04			YES
Lead	mg/kg	3.85E+01	4.00E+02	1.08E+01				1.63E+01				1.45E+01				1.30E+01			
Magnesium	mg/kg	7.66E+02	NA	4.79E+02				5.38E+02				5.76E+02				3.93E+02			
Manganese	mg/kg	1.36E+03	3.63E+02	8.19E+01	J			1.52E+03		YES	YES	3.54E+02				1.05E+02	J		
Mercury	mg/kg	7.00E-02	2.33E+00	1.14E-01		YES		2.95E-02	J			9.84E-02	J	YES		1.47E-01		YES	
Nickel	mg/kg	1.29E+01	1.54E+02	6.53E+00				8.29E+00				6.96E+00				6.62E+00			
Potassium	mg/kg	7.11E+02	NA	4.45E+02	J			4.08E+02	J			4.55E+02	J			3.99E+02	J		
Sodium	mg/kg	7.02E+02	NA	5.84E+01	J			6.03E+01	J			5.57E+01	J			5.84E+01	J		
Vanadium	mg/kg	6.49E+01	5.31E+01	3.11E+01				2.11E+01				2.45E+01				4.84E+01			
Zinc	mg/kg	3.49E+01	2.34E+03	1.29E+01				1.86E+01				1.50E+01				1.37E+01			
VOLATILE ORGANIC COMPOUNDS																			
Acetone	mg/kg	NA	7.76E+02	1.60E-01	J			NR				7.50E-02	J			NR			
Methylene chloride	mg/kg	NA	8.41E+01	ND				NR				2.30E-03	B			NR			

Table 5-2

**Subsurface Soil Analytical Results
Former Rifle/Machine Gun Range, Parcel 104Q
Fort McClellan, Calhoun County, Alabama**

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Sample Location Sample Number Sample Date Sample Depth (Feet)				HR-104Q-GP05 QK0012 13-Jun-02 2-4				HR-104Q-GP06 QK0014 13-Jun-02 2-4				HR-104Q-GP07 QK0016 26-Apr-02 3-4				HR-104Q-GP08 QK0018 14-Jun-02 3-4			
Parameter	Units	BKG ^a	SSSL ^b	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
METALS																			
Aluminum	mg/kg	1.36E+04	7.80E+03	1.77E+04		YES	YES	1.56E+04		YES	YES	2.08E+04		YES	YES	1.39E+04		YES	YES
Arsenic	mg/kg	1.83E+01	4.26E-01	3.88E+00			YES	4.12E+00			YES	5.60E+00			YES	4.11E+00			YES
Barium	mg/kg	2.34E+02	5.47E+02	5.27E+01				1.17E+02				5.22E+01				9.45E+01			
Beryllium	mg/kg	8.60E-01	9.60E+00	ND				5.98E-01	J			4.84E-01	J			4.68E-01	J		
Calcium	mg/kg	6.37E+02	NA	2.89E+02	J			2.97E+02	J			4.85E+02				3.99E+02			
Chromium	mg/kg	3.83E+01	2.32E+01	2.01E+01				1.75E+01				1.84E+01				1.01E+01			
Cobalt	mg/kg	1.75E+01	4.68E+02	2.91E+00				4.99E+00				3.77E+00				5.49E+00			
Copper	mg/kg	1.94E+01	3.13E+02	4.73E+00				4.18E+00				8.02E+00				4.36E+00			
Iron	mg/kg	4.48E+04	2.34E+03	1.82E+04			YES	1.23E+04			YES	2.30E+04			YES	1.47E+04			YES
Lead	mg/kg	3.85E+01	4.00E+02	1.26E+01				1.61E+01				1.63E+01				1.88E+01			
Magnesium	mg/kg	7.66E+02	NA	3.88E+02				3.52E+02				4.85E+02				3.82E+02			
Manganese	mg/kg	1.36E+03	3.63E+02	2.01E+02	J			1.39E+03	J	YES	YES	4.50E+02			YES	1.46E+03		YES	YES
Mercury	mg/kg	7.00E-02	2.33E+00	7.31E-02	J	YES		ND				1.62E-01		YES		4.27E-02	J		
Nickel	mg/kg	1.29E+01	1.54E+02	6.69E+00				7.10E+00				6.94E+00				5.85E+00			
Potassium	mg/kg	7.11E+02	NA	4.23E+02	J			3.95E+02	J			3.29E+02	J			3.40E+02	J		
Sodium	mg/kg	7.02E+02	NA	4.57E+01	J			4.45E+01	J			ND				6.78E+01	J		
Vanadium	mg/kg	6.49E+01	5.31E+01	3.26E+01				2.31E+01				4.24E+01				2.39E+01			
Zinc	mg/kg	3.49E+01	2.34E+03	1.19E+01				1.17E+01				1.58E+01				1.26E+01	J		
VOLATILE ORGANIC COMPOUNDS																			
Acetone	mg/kg	NA	7.76E+02	NR				NR				NR				NR			
Methylene chloride	mg/kg	NA	8.41E+01	NR				NR				NR				NR			

Table 5-2

Subsurface Soil Analytical Results
Former Rifle/Machine Gun Range, Parcel 104Q
Fort McClellan, Calhoun County, Alabama

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Sample Location Sample Number Sample Date Sample Depth (Feet)				HR-104Q-GP09 QK0020 14-Jun-02 3-4				HR-104Q-GP10 QK0022 14-Jun-02 2-4				HR-104Q-GP11 QK0024 14-Jun-02 3-4				HR-104Q-GP12 QK0026 14-Jun-02 3-4			
Parameter	Units	BKG ^a	SSSL ^b	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
METALS																			
Aluminum	mg/kg	1.36E+04	7.80E+03	2.00E+04		YES	YES	1.49E+04		YES	YES	2.27E+04		YES	YES	1.26E+04			YES
Arsenic	mg/kg	1.83E+01	4.26E-01	5.57E+00			YES	4.03E+00			YES	5.40E+00			YES	3.93E+00			YES
Barium	mg/kg	2.34E+02	5.47E+02	4.26E+01				7.73E+01				4.90E+01				4.94E+01			
Beryllium	mg/kg	8.60E-01	9.60E+00	ND				4.04E-01	J			ND				ND			
Calcium	mg/kg	6.37E+02	NA	5.92E+02				3.11E+02				5.04E+02				3.35E+02			
Chromium	mg/kg	3.83E+01	2.32E+01	1.39E+01				9.00E+00				1.40E+01				1.04E+01			
Cobalt	mg/kg	1.75E+01	4.68E+02	4.31E+00				4.86E+00				4.91E+00				2.49E+00			
Copper	mg/kg	1.94E+01	3.13E+02	5.99E+00				3.92E+00				9.30E+00				4.59E+00			
Iron	mg/kg	4.48E+04	2.34E+03	2.07E+04			YES	1.40E+04			YES	2.06E+04			YES	1.35E+04			YES
Lead	mg/kg	3.85E+01	4.00E+02	1.30E+01				1.47E+01				1.60E+01				9.51E+00			
Magnesium	mg/kg	7.66E+02	NA	5.00E+02				3.47E+02				5.44E+02				4.15E+02			
Manganese	mg/kg	1.36E+03	3.63E+02	2.87E+02				8.15E+02			YES	4.12E+02			YES	1.78E+02			
Mercury	mg/kg	7.00E-02	2.33E+00	1.23E-01		YES		4.41E-02	J			1.25E-01		YES		5.26E-02	J		
Nickel	mg/kg	1.29E+01	1.54E+02	6.67E+00				5.79E+00				7.58E+00				4.69E+00			
Potassium	mg/kg	7.11E+02	NA	4.25E+02	B			3.60E+02	J			4.22E+02	B			3.71E+02	B		
Sodium	mg/kg	7.02E+02	NA	7.03E+01	J			5.87E+01	J			6.59E+01	J			5.83E+01	J		
Vanadium	mg/kg	6.49E+01	5.31E+01	3.41E+01				2.34E+01				3.53E+01				2.24E+01			
Zinc	mg/kg	3.49E+01	2.34E+03	1.51E+01	J			1.10E+01	J			1.60E+01	J			1.08E+01	J		
VOLATILE ORGANIC COMPOUNDS																			
Acetone	mg/kg	NA	7.76E+02	NR				NR				NR				NR			
Methylene chloride	mg/kg	NA	8.41E+01	NR				NR				NR				NR			

Table 5-2

**Subsurface Soil Analytical Results
Former Rifle/Machine Gun Range, Parcel 104Q
Fort McClellan, Calhoun County, Alabama**

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Sample Location Sample Number Sample Date Sample Depth (Feet)				HR-104Q-GP13 QK0028 14-Jun-02 3-4				HR-104Q-GP14 QK0030 17-Jun-02 3-4				HR-104Q-GP15 QK0032 17-Jun-02 3-4				HR-104Q-GP16 QK0034 17-Jun-02 3-4			
Parameter	Units	BKG ^a	SSSL ^b	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
METALS																			
Aluminum	mg/kg	1.36E+04	7.80E+03	1.52E+04		YES	YES	1.18E+04			YES	1.88E+04		YES	YES	2.33E+04		YES	YES
Arsenic	mg/kg	1.83E+01	4.26E-01	3.44E+00			YES	2.86E+00			YES	4.39E+00			YES	7.34E+00			YES
Barium	mg/kg	2.34E+02	5.47E+02	7.03E+01				1.95E+01				1.01E+02				2.31E+01			
Beryllium	mg/kg	8.60E-01	9.60E+00	4.21E-01 J				ND				6.51E-01 J				ND			
Calcium	mg/kg	6.37E+02	NA	4.37E+02				1.79E+02				3.75E+02				1.75E+02			
Chromium	mg/kg	3.83E+01	2.32E+01	8.25E+00				7.76E+00				9.34E+00				2.50E+01			YES
Cobalt	mg/kg	1.75E+01	4.68E+02	4.57E+00				2.46E+00				5.89E+00				ND			
Copper	mg/kg	1.94E+01	3.13E+02	4.88E+00				4.85E+00				5.40E+00				8.57E+00			
Iron	mg/kg	4.48E+04	2.34E+03	1.09E+04		YES		8.66E+03			YES	1.25E+04			YES	2.55E+04			YES
Lead	mg/kg	3.85E+01	4.00E+02	1.21E+01				1.06E+01				1.33E+01				8.51E+00			
Magnesium	mg/kg	7.66E+02	NA	5.30E+02				3.41E+02				5.65E+02				3.85E+02			
Manganese	mg/kg	1.36E+03	3.63E+02	1.25E+03		YES		1.65E+02				1.08E+03			YES	2.04E+02			
Mercury	mg/kg	7.00E-02	2.33E+00	3.02E-02 J				5.90E-02 J				4.65E-02 J				1.04E-01 J	YES		
Nickel	mg/kg	1.29E+01	1.54E+02	7.13E+00				5.32E+00				8.06E+00				9.09E+00			
Potassium	mg/kg	7.11E+02	NA	4.51E+02 B				2.11E+02 B				4.33E+02 B				2.95E+02 B			
Sodium	mg/kg	7.02E+02	NA	6.29E+01 J				7.60E+01 J				6.32E+01 J				5.62E+01 J			
Vanadium	mg/kg	6.49E+01	5.31E+01	2.03E+01				1.71E+01				2.39E+01				5.01E+01			
Zinc	mg/kg	3.49E+01	2.34E+03	1.42E+01 J				1.34E+01 J				1.57E+01 J				1.82E+01 J			
VOLATILE ORGANIC COMPOUNDS																			
Acetone	mg/kg	NA	7.76E+02	NR				NR				NR				NR			
Methylene chloride	mg/kg	NA	8.41E+01	NR				NR				NR				NR			

Table 5-2

Subsurface Soil Analytical Results
Former Rifle/Machine Gun Range, Parcel 104Q
Fort McClellan, Calhoun County, Alabama

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Sample Location Sample Number Sample Date Sample Depth (Feet)				HR-104Q-GP17 QK0036 17-Jun-02 3-4				HR-104Q-GP18 QK0038 18-Jun-02 1-2				HR-104Q-GP19 QK0041 18-Jun-02 1-2			
Parameter	Units	BKG ^a	SSSL ^b	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
METALS															
Aluminum	mg/kg	1.36E+04	7.80E+03	3.18E+04		YES	YES	6.60E+03				5.53E+03			
Arsenic	mg/kg	1.83E+01	4.26E-01	6.74E+00			YES	1.65E+00			YES	1.48E+00			YES
Barium	mg/kg	2.34E+02	5.47E+02	4.68E+01				5.38E+01				6.99E+01			
Beryllium	mg/kg	8.60E-01	9.60E+00	4.59E-01 J				ND				ND			
Calcium	mg/kg	6.37E+02	NA	3.05E+02				1.54E+02				2.88E+02			
Chromium	mg/kg	3.83E+01	2.32E+01	1.82E+01				3.92E+00				4.41E+00			
Cobalt	mg/kg	1.75E+01	4.68E+02	2.65E+00				3.22E+00				2.06E+00 J			
Copper	mg/kg	1.94E+01	3.13E+02	7.73E+00				2.24E+00				2.89E+00			
Iron	mg/kg	4.48E+04	2.34E+03	2.16E+04		YES		4.06E+03			YES	3.04E+03			YES
Lead	mg/kg	3.85E+01	4.00E+02	1.13E+01				4.58E+00				5.67E+00			
Magnesium	mg/kg	7.66E+02	NA	6.28E+02				3.11E+02				2.92E+02			
Manganese	mg/kg	1.36E+03	3.63E+02	1.71E+02				1.57E+02				2.50E+02			
Mercury	mg/kg	7.00E-02	2.33E+00	2.42E-01		YES		ND				ND			
Nickel	mg/kg	1.29E+01	1.54E+02	1.09E+01				3.81E+00				3.43E+00			
Potassium	mg/kg	7.11E+02	NA	4.86E+02 J				2.30E+02 J				1.90E+02 J			
Sodium	mg/kg	7.02E+02	NA	4.93E+01 J				6.18E+01 J				5.91E+01 J			
Vanadium	mg/kg	6.49E+01	5.31E+01	4.26E+01				8.26E+00				6.53E+00			
Zinc	mg/kg	3.49E+01	2.34E+03	1.98E+01				8.10E+00				1.25E+01			
VOLATILE ORGANIC COMPOUNDS															
Acetone	mg/kg	NA	7.76E+02	NR				NR				NR			
Methylene chloride	mg/kg	NA	8.41E+01	NR				NR				NR			

Table 5-2

**Subsurface Soil Analytical Results
Former Rifle/Machine Gun Range, Parcel 104Q
Fort McClellan, Calhoun County, Alabama**

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Sample Location Sample Number Sample Date Sample Depth (Feet)				HR-104Q-GP20 QK0043 17-Jun-02 3-4				HR-104Q-MW01 QK0046 23-Apr-02 3-4				HR-104Q-MW02 QK0048 26-Apr-02 3-4			
Parameter	Units	BKG ^a	SSSL ^b	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
METALS															
Aluminum	mg/kg	1.36E+04	7.80E+03	2.41E+04		YES	YES	2.32E+04		YES	YES	1.88E+04		YES	YES
Arsenic	mg/kg	1.83E+01	4.26E-01	5.34E+00			YES	5.87E+00			YES	5.65E+00			YES
Barium	mg/kg	2.34E+02	5.47E+02	7.77E+01				3.64E+01				2.33E+01			
Beryllium	mg/kg	8.60E-01	9.60E+00	5.26E-01	J			4.60E-01	J			4.63E-01	J		
Calcium	mg/kg	6.37E+02	NA	4.22E+02				5.52E+02				1.22E+02			
Chromium	mg/kg	3.83E+01	2.32E+01	9.61E+00				1.70E+01				3.15E+01			YES
Cobalt	mg/kg	1.75E+01	4.68E+02	6.41E+00				3.32E+00				1.78E+00	J		
Copper	mg/kg	1.94E+01	3.13E+02	6.79E+00				7.77E+00				7.04E+00			
Iron	mg/kg	4.48E+04	2.34E+03	1.53E+04			YES	2.53E+04			YES	3.19E+04			YES
Lead	mg/kg	3.85E+01	4.00E+02	1.55E+01				1.53E+01				1.17E+01			
Magnesium	mg/kg	7.66E+02	NA	6.98E+02				5.19E+02				2.80E+02			
Manganese	mg/kg	1.36E+03	3.63E+02	2.06E+03		YES	YES	2.23E+02				8.09E+01			
Mercury	mg/kg	7.00E-02	2.33E+00	7.06E-02	J	YES		2.01E-01		YES		1.20E-01	J	YES	
Nickel	mg/kg	1.29E+01	1.54E+02	1.07E+01				6.39E+00				4.11E+00			
Potassium	mg/kg	7.11E+02	NA	5.62E+02	J			3.25E+02	J			1.37E+02	J		
Sodium	mg/kg	7.02E+02	NA	5.62E+01	J			4.24E+01	J			6.26E+01	J		
Vanadium	mg/kg	6.49E+01	5.31E+01	3.03E+01				4.70E+01				6.56E+01		YES	YES
Zinc	mg/kg	3.49E+01	2.34E+03	1.96E+01				1.55E+01				1.08E+01			
VOLATILE ORGANIC COMPOUNDS															
Acetone	mg/kg	NA	7.76E+02	NR				NR				NR			
Methylene chloride	mg/kg	NA	8.41E+01	NR				NR				NR			

Analyses performed using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods.

^a BKG - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in SAIC, 1998, *Final Background Metals Survey Report, Fort McClellan, Alabama*, July.

^b Residential human health site-specific screening level (SSSL) as given in IT Corporation (2000), *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama*, July.

B - Analyte detected in laboratory or field blank at concentration greater than the reporting limit.

J - Compound was positively identified; reported value is an estimated concentration.

mg/kg - Milligrams per kilogram.

NA - Not available.

ND - Not detected.

NR - Not requested.

Qual - Data validation qualifier.

Table 5-3

Groundwater Analytical Results
Former Rifle/Machine Gun Range, Parcel 104Q
Fort McClellan, Calhoun County, Alabama

Sample Location Sample Number Sample Date				HR-104Q-MW01 QK3001 20-Jun-02				HR-104Q-MW02 QK3003 21-Jun-02			
Parameter	Units	BKG ^a	SSSL ^b	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
METALS											
Barium	mg/L	1.27E-01	1.10E-01	1.12E-02				4.59E-03	J		
Calcium	mg/L	5.65E+01	NA	1.84E+00				2.40E+01			
Iron	mg/L	7.04E+00	4.69E-01	6.15E-03	J			6.86E-02	B		
Magnesium	mg/L	2.13E+01	NA	1.06E+00				1.38E+01			
Manganese	mg/L	5.81E-01	7.35E-02	5.52E-02	J			7.02E-03	J		
Potassium	mg/L	7.20E+00	NA	ND				1.17E+00	J		
Sodium	mg/L	1.48E+01	NA	9.08E-01	B			8.24E-01	B		
VOLATILE ORGANIC COMPOUNDS											
Methylene chloride	mg/L	NA	7.85E-03	4.20E-04	B			NR			

Analyses performed using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods.

^a BKG - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in SAIC, 1998, *Final Background Metals Survey Report, Fort McClellan, Alabama*, July.

^b Residential human health site-specific screening level (SSSL) as given in IT Corporation (2000), *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama*, July.

B - Analyte detected in laboratory or field blank at concentration greater than the reporting limit.

J - Compound was positively identified; reported value is an estimated concentration.

mg/L - Milligrams per liter.

NA - Not available.

ND - Not detected.

NR - Not requested.

Qual - Data validation qualifier.

- Aluminum (16,700 to 27,200 mg/kg) exceeded its SSSL (7,803 mg/kg) and background (16,306 mg/kg) at six sample locations (HR-104Q-GP04, HR-104Q-GP05, HR-104Q-GP14, HR-104Q-GP15, HR-104Q-GP16, and HR-104Q-GP20).
- Chromium (74.3 mg/kg) exceeded its SSSL (23.2 mg/kg) and background (37.0 mg/kg) at sample location HR-104Q-GP03.
- Manganese (1,630 to 2,400 mg/kg) exceeded its SSSL (363 mg/kg) and background (1,579 mg/kg) at five sample locations (HR-104Q-GP07, HR-104Q-GP08, HR-104Q-GP13, HR-104Q-GP20, and HR-104Q-MW01).

The concentrations of six metals (aluminum, chromium, iron, manganese, mercury, and vanadium) exceeded their respective ESVs. Of these, concentrations of aluminum, chromium, manganese, and mercury also exceeded their respective background concentrations in one or more samples:

- Aluminum (16,700 to 27,200 mg/kg) exceeded its ESV (50 mg/kg) and background (16,306 mg/kg) at six sample locations (HR-104Q-GP04, HR-104Q-GP05, HR-104Q-GP14, HR-104Q-GP15, HR-104Q-GP16, and HR-104Q-GP20).
- Chromium (74.3 mg/kg) exceeded its ESV (0.4 mg/kg) and background (37.0 mg/kg) at sample location HR-104Q-GP03.
- Manganese (1,630 to 2,400 mg/kg) exceeded its ESV (100 mg/kg) and background (1,579 mg/kg) at five sample locations (HR-104Q-GP07, HR-104Q-GP08, HR-104Q-GP13, HR-104Q-GP20, and HR-104Q-MW01).
- Mercury (0.15 and 0.11 mg/kg) exceeded its ESV (0.10 mg/kg) and background (0.08 mg/kg) at two sample locations (HR-104Q-GP13 and HR-104Q-GP16).

Volatile Organic Compounds. Two surface soil sample locations were analyzed for VOCs: HR-104Q-GP01 and HR-104Q-GP03. A total of three VOCs (2-butanone, acetone, and p-cymene) were detected in the samples at concentrations below SSSLs and ESVs.

Semivolatile Organic Compounds. Two surface soil sample locations were analyzed for SVOCs: HR-104Q-GP01 and HR-104Q-GP03. SVOCs were not detected in the samples.

Pesticides. Two surface soil sample locations were analyzed for pesticides: HR-104Q-GP01 and HR-104Q-GP03. Seven pesticides were detected at one sample location (HR-104Q-GP01) at concentrations below SSSLs. The concentrations of three compounds (4,4'-dichlorodiphenyltrichloroethane [DDT], dieldrin, and endrin) exceeded their respective ESVs in

the sample. Pesticide concentrations in the sample ranged from 0.00034 to 0.0035 milligrams per kilogram (mg/kg); all of the results were flagged with a “J” data qualifier, indicating that the compounds were detected at estimated concentrations below method reporting limits.

Herbicides. Two surface soil sample locations were analyzed for herbicides: HR-104Q-GP01 and HR-104Q-GP03. One pesticide (4-chloro-2-methylphenoxyacetic acid [MCPA]) was detected at one sample location (HR-104Q-GP01) at a concentration (0.93 mg/kg) below its SSSL but exceeding its ESV (0.1 mg/kg). However, the analytical result was flagged with a “J” data qualifier, indicating that the compound was detected at an estimated concentration below the method reporting limit.

Explosives. Explosives were not detected in the surface soil samples.

5.2 Subsurface Soil Analytical Results

Twenty-two subsurface soil samples were collected for chemical analysis at the Former Rifle/Machine Gun Range, Parcel 104Q. Subsurface soil samples were collected at depths greater than 1 foot bgs at the locations shown on Figure 3-1. Analytical results were compared to residential human health SSSLs and metals background concentrations, as presented in Table 5-2.

Metals. A total of 18 metals were detected in the subsurface soil samples collected at the site. The concentrations of six metals (aluminum, arsenic, chromium, iron, manganese, and vanadium) exceeded their respective SSSLs in one or more samples. Of these, concentrations of aluminum, manganese, and vanadium also exceeded their respective background concentrations:

- Aluminum (13,900 to 31,800 mg/kg) exceeded its SSSL (7,803 mg/kg) and background (13,591 mg/kg) at 18 sample locations.
- Manganese (1,390 to 2,060 mg/kg) exceeded its SSSL (363 mg/kg) and background (1,355 mg/kg) at four sample locations (HR-104Q-GP02, HR-104Q-GP06, HR-104Q-GP08, and HR-104Q-GP20).
- Vanadium (65.6 mg/kg) exceeded its SSSL (53.1 mg/kg) and background (64.9 mg/kg) at sample location HR-104Q-MW02.

Volatile Organic Compounds. Two subsurface soil sample locations were analyzed for VOCs: HR-104Q-GP01 and HR-104Q-GP03. A total of two VOCs (acetone and methylene chloride) were detected in the samples at concentrations below SSSLs.

Semivolatile Organic Compounds. Two subsurface soil sample locations were analyzed for SVOCs: HR-104Q-GP01 and HR-104Q-GP03. SVOCs were not detected in the samples.

Pesticides. Two subsurface soil sample locations were analyzed for pesticides: HR-104Q-GP01 and HR-104Q-GP03. Pesticides were not detected in the samples.

Herbicides. Two subsurface soil sample locations were analyzed for herbicides: HR-104Q-GP01 and HR-104Q-GP03. Herbicides were not detected in the samples.

Explosives. Explosives were not detected in the subsurface soil samples.

5.3 Groundwater Analytical Results

Two groundwater samples were collected for chemical analysis at the Former Rifle/Machine Gun Range, Parcel 104Q, at the locations shown on Figure 3-1. Analytical results were compared to residential human health SSSLs and metals background concentrations, as presented in Table 5-3.

Metals. A total of seven metals were detected in the groundwater samples collected at the site at concentrations below SSSLs and background concentrations.

Volatile Organic Compounds. One groundwater sample location, HR-104Q-MW01, was analyzed for VOCs. One VOC (methylene chloride) was detected in the sample at a concentration below its SSSL.

Semivolatile Organic Compounds. One groundwater sample location, HR-104Q-MW01, was analyzed for SVOCs. SVOCs were not detected in the sample.

Pesticides. One groundwater sample location, HR-104Q-MW01, was analyzed for pesticides. Pesticides were not detected in the sample.

Herbicides. One groundwater sample location, HR-104Q-MW01, was analyzed for herbicides. Herbicides were not detected in the sample.

Explosives. Explosives were not detected in the groundwater samples.

5.4 Statistical and Geochemical Evaluations of Site Metals Data

Site metals data were further evaluated using statistical and geochemical methods to determine if the metals detected in site media are site related. This multi-tiered approach is described in the Shaw technical memorandum "Selecting Site-Related Chemicals for Human Health and Ecological Risk Assessments for FTMC: Revision 2" (Shaw, 2003). The statistical and geochemical evaluations determined that the metals detected in site media were all naturally occurring (Appendix G).

5.5 Human Health Preliminary Risk Assessment

A human health preliminary risk assessment (PRA) was performed to further characterize the potential threat to human health from exposure to environmental media at the Former Rifle/Machine Gun Range, Parcel 104Q. The PRA approach was developed at the request of EPA and ADEM to provide a fast and inexpensive estimation of risk for relatively simple sites. It was derived from the streamlined risk assessment (SRA) protocol developed for FTMC and documented in the installation-wide work plan (IT, 1998). A PRA is a simplified version of an SRA, differing primarily in that the maximum detected concentration (MDC) rather than an estimate of average is adopted as the source-term concentration for use in the risk assessment. However, a PRA cannot be less conservative (protective) than an SRA and is generally more protective. The PRA for Parcel 104Q is included as Appendix H. It discusses the environmental media of interest, selection of site-related chemicals, selection of COPCs, risk characterization, uncertainty evaluation, and conclusions.

The foundation of the PRA is the SSSL, which incorporates all the exposure and toxicological assumptions and precision of a complete baseline risk assessment. SSSLs are receptor-, medium-, and chemical-specific risk-based concentrations that are used to screen media to select COPCs and to characterize the risk, i.e., compute the incremental lifetime cancer risk (ILCR) and hazard index (HI) for noncancer effects associated with exposure to site media.

The SSSLs applied to a given site represent the most highly exposed receptor scenario for each of several plausible uses for the site. For Parcel 104Q, three receptor scenarios were evaluated: groundskeeper, construction worker, and resident. COPCs were selected from the site-related chemicals identified in the previous section by comparing the MDC of the site-related chemical with the appropriate SSSL. Chemicals that were identified as not being site-related were dropped from further consideration because their presence was not attributed to site activities. The COPCs selected in this manner are the chemicals in each medium that may contribute significantly to cancer risk or to the potential for noncancer effects. As noted above, the MDC

1 was selected as the source-term concentration for use in risk characterization. ILCR and HI
2 values were estimated for each COPC in each medium and were summed to obtain total ILCR
3 and HI values for each receptor.

4
5 Low levels of VOCs, pesticides, and herbicides were detected in surface soil. Low levels of
6 VOCs were detected in subsurface soil. With the exception of methylene chloride, a common
7 laboratory contaminant, no organic chemicals were identified in groundwater. No chemicals
8 were selected as COPCs in site media. The PRA concluded that exposure to site media is
9 unlikely to result in adverse health effects for any of the receptors evaluated.

11 **5.6 Preliminary Ecological Risk Assessment**

12 A PERA was performed to further characterize the potential threat to ecological receptors from
13 exposure to environmental media at the Former Rifle Machine Gun Range, Parcel 104Q. The
14 PERA approach was derived from the screening-level ecological risk assessment protocol
15 developed for FTMC and documented in the installation-wide work plan (IT, 1998). The PERA
16 for Parcel 104Q is included as Appendix I. It discusses the ecological habitat, environmental
17 media of interest and data selection, selection of constituents of potential ecological concern
18 (COPEC), risk characterization, uncertainty analysis, and conclusions.

19
20 The medium of interest at Parcel 104Q is surface soil. There are no water bodies or wetlands
21 associated with the site. Exposures to subsurface soil and groundwater are unlikely for
22 ecological receptors at this site. In order to determine whether constituents detected in site
23 samples have the potential to pose adverse ecological risks, screening-level hazard quotients
24 were developed via a three-step process as follows:

- 25
- 26 1) Comparison to ESVs
- 27 2) Identification of essential macronutrients
- 28 3) Comparison to naturally occurring background concentrations.
- 29

30 The ESVs represent the most conservative values available from various literature sources and
31 have been selected to be protective of the most sensitive ecological assessment endpoints. The
32 ESVs have been developed specifically for FTMC in conjunction with EPA Region 4 and are
33 presented in the *Final Human Health and Ecological Screening Values and PAH Background*
34 *Summary Report* (IT, 2000b). The ESVs are based on no-observed-adverse-effect-levels
35 (NOAEL), when available. If a NOAEL-based ESV was not available for a certain constituent,
36 then the most health-protective value available from the scientific literature was used. If a

1 constituent was detected at a maximum concentration that exceeded its ESV, was not an essential
2 macronutrient, and was greater than the naturally occurring levels at FTMC, then it was selected
3 as a COPEC for further ecological risk characterization.
4

5 The PERA initially identified three pesticides (4,4'-DDT, dieldrin, and endrin) and one herbicide
6 (MCPA) as COPECs in surface soil at Parcel 104Q. The PERA considered additional lines of
7 evidence to further refine the selection of COPECs. Additional lines of evidence included
8 frequency of detection, magnitude of hazard quotient screening value, comparison to alternative
9 ESVs, and association of a chemical with known Army activities. Following COPEC selection
10 refinement using additional lines of evidence, the PERA determined that these constituents
11 should not be retained as COPECs. The PERA concluded that these chemicals are unlikely to
12 pose a risk to ecological receptors at the site.
13

6.0 Summary, Conclusions, and Recommendations

Shaw completed an SI at the Former Rifle/Machine Gun Range, Parcel 104Q, at FTMC in Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at the site at concentrations that pose an unacceptable risk to human health or the environment. The SI at the Former Rifle/Machine Gun Range, Parcel 104Q, consisted of the collection and analysis of 22 surface soil samples, 22 subsurface soil samples, and 2 groundwater samples. In addition, two permanent monitoring wells were installed in the saturated zone to facilitate groundwater sample collection and provide site-specific geological and hydrogeological characterization information.

Chemical analysis of samples collected at the Former Rifle/Machine Gun Range, Parcel 104Q, indicates that metals, VOCs, pesticides, and one herbicide were detected in site media. SVOCs and explosives were not detected in site media. Analytical results were compared to the SSSLs and ESVs developed for human health and ecological risk evaluations as part of the ongoing SIs being performed under the BRAC Environmental Restoration Program at FTMC. Additionally, metals concentrations exceeding SSSLs and ESVs were compared to medium-specific background screening values (SAIC, 1998). Site metals data were further evaluated using statistical and geochemical methods to select site-related metals. A PRA and PERA were also performed to further characterize the potential threat to human health and the environment.

Although Parcel 104Q is projected for industrial and passive recreation reuse (EDAW Inc., 1997), the analytical data were evaluated against a residential reuse scenario to determine if the site is suitable for unrestricted future use. All metals in soil and groundwater were determined to be present at naturally occurring levels. The organic chemicals detected in site media were present at concentrations below their SSSLs. Therefore, no chemicals were selected as COPECs in the PRA. The PRA concluded that exposure to site media does not pose a threat to human health.

COPECs initially identified in the PERA were three pesticides (4,4'-DDT, dieldrin, and endrin) and one herbicide (MCPA) in surface soil. Upon consideration of additional lines of evidence, however, the PERA determined that these chemicals should not be retained as COPECs. The PERA concluded that these compounds are unlikely to pose a risk to ecological receptors.

Based on the results of the SI, past operations at the Former Rifle/Machine Gun Range, Parcel 104Q, have not adversely impacted the environment. The metals and chemical compounds detected in site media do not pose an unacceptable risk to human health and the environment.

- 1 Therefore, Shaw recommends "No Further Action" and unrestricted land reuse with regard to
- 2 CERCLA-related hazardous substances at the Former Rifle/Machine Gun Range, Parcel 104Q.

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